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AVIATION DIGEST

GRASS-HOPPERS

U.S. Army Aviation's 40th Birthday

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Honorable John O. Marsh Jr.
Secretary of the Army

Richard K. Tierney
Editor

The mission of the *U.S. Army Aviation Digest (USPS 415-350)* is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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THIS IS ARMY Aviation's 40th birthmonth. It began auspiciously and in great style with the celebration earlier this month at Ft. Rucker and now ends in the same fashion with this history oriented issue of the *Aviation Digest.*

Our anniversary festivities (4 to 6 June) were a tremendous success, thanks to all who attended and those who worked diligently to prepare a calendar of events that truly did offer something for everyone from yesteryear through today. One of the very key events was a formal dedication of the site for the new Army Aviation Museum. With the site now approved and the fund raising effort nearing the halfway mark, we are nearing the reality that it is going to be a home for Army Aviation history, memorabilia and vintage aircraft through the years.

Another most significant event was the memorialization of an academic building in the Warrant Officer Career College complex in honor of CWO Manford L. Kleiv who lost his life during an aerial mission in the Vietnam conflict. It is most fitting that we recognize Mr. Kleiv's contribution and sacrifice by such a structure, but the memorialization of the building is also representative of the great contribution to all of Army Aviation, both in peace and in war, by our aviation warrant officers.

One of the most distinguished guests who "came home" for the celebration was retired Brigadier General William W. Ford, the "Daddy Grasshopper" of Army aviators. General Ford and all "Grasshoppers" were reunited at Ft. Rucker during the birthday celebration and reviewed the troops during an impressive retreat ceremony conducted by the First Aviation Brigade. Thus, it is entirely fitting that this month's lead article should be entitled "Grasshoppers" and provide an account from General Ford's personal experiences as one who was so instrumental in the birth of Army Aviation.

Another viewpoint of our past and our present is presented by Colonel Emmett F. Knight, commander of the AVRADCOM Advanced Technology Laboratory at Ft. Eustis. He has written "Army Aviation—Age Forty," a pungent poetic description of the growth, snags and progress that have marked these four decades.

And even the history of how people have been chosen to be Army aviators, past and present, is included to add depth to your knowledge of our business. "Army Aviator Selection Research: Then and Now" by Dr. John A. Dohme, William R. Brown and Dr. Michael G. Sanders identifies testing procedures that have been and are being used and ones that are forecast for the future—all intended to reduce the attrition in the flight training program and enhance the quality of our product.

Much of the luster of Army Aviation's history has been derived from our people's willingness to be good neighbors to civilian communities, providing service and support where needed. Colonel Richard E. Mackin describes such an act in "Flight to Arizpe"—a mission of international neighborliness.

Such good relationships also exist with members of other services; witness the article from Navy Lieutenant James R. Dobson entitled "A Detailed History of the U-21." It is a very revealing bit of nostalgia for our fixed wing fanciers.

As we concluded the 40th Birthday celebration, not only had hundreds of oldtimers visited their "Center of Training Excellence" to share a tale or two, but also letters of congratulation and recognition poured in from around the world. Space simply does not permit us to print them all, but I would like to at least share a few excerpts with you. From these you will gain a further appreciation not only of esteem in which Army Aviation is now held but more importantly the measure of performance expected of aviators today to meet our Army commitments worldwide.

- The achievements and contributions Army Aviation and Fort Rucker have made to the United States Army are recognized throughout the world . . . You can be proud of the exemplary manner in which you have continuously accomplished your mission "Above the Best."—John O. Marsh Jr., Secretary of the Army
- Army Aviation has won its spurs many times over, on many battlefields, since its birth, and

Continued on Inside Back Cover

Major General Carl H. McNair Jr.
Commander, U.S. Army Aviation Center
Fort Rucker, AL

Once "redlegs" sought in vain a tree
Up which to shinny and to see
The shells that came riproaring out
Their field artillery cannon spout.

But then, "O-ho!" the wise ones said,
"This ground observer stuff is dead.
Give us a chariot with wings;
We'll leap aloft as though on springs
From hedgerow, beach or tennis court
And undertake the gentle sport

FORTY YEARS OF ARMY AVIATION

This is the first of a five-part series that will tell Army Aviation's story from its beginning to the present. It is authored by Brigadier General William W. Ford (U.S. Army, Retired), and he gives an account of the actions that led to the birth of Army Aviation. The succeeding four sections will be by Richard K. Tierney and will be titled "Building a Training Program," "Combat," "Armed Helicopters" and "Policies and Organizations." This history of Army Aviation will be a valuable addition to the library of every interested member of the Army Aviation community

MONTHLY WRITING AWARD

PART I:

GRASS-HOPPERS

Of heaping quantities of lead
Upon the Kraut's defenseless head."

'Twas done! A million so-called pilots
(Never considered shrinking violets)
Forthwith began to strut their stuff.
Believe me, boy, it was enough!
They filled the air with Cubs, and though
They flew the damned things low and slow
They (ponder this with greatest awe:)
With some assistance won the war.

By Brigadier General William W. Ford, U.S. Army (Retired)

This article is adapted from ***Wagon Soldier,*** a private publication, 1980 by William Wallace Ford.

The poem or whatever-it-is at left above (spoken with a Deep South accent), written for a celebration dinner at the end of World War II, concisely states the Field Artilleryman's (Redleg's) need for air observation, the solution devised, and—perhaps with some exaggeration—the results achieved.

People who visited Ft. Rucker, AL, on 6 June 1982 to celebrate Army Aviation's 40th birthday anniversary were apt to notice a score or more middle-aged characters wandering about the place, gawking at the newfangled machines and poking into things. On their coats, especially their blazers, some wore a large, gaudy emblem which looked like a grasshopper. Well, by gosh, it *was* a grasshopper! The wearers *called* themselves Grasshoppers. They belong to the first generation of Army aviators. This is the story of how they came to be.

The end of World War I found military air observation at a crossroads. The device upon which the U.S. Army had depended since Civil War days, the hydrogen-filled, captive balloon, was due to be phased out. Its vulnerability to attack by hostile fighters and to the growing range and accuracy of antiaircraft fire rendered it completely obsolete. Some 265 balloons had been sent to France; of these, 77 had participated in action and 48 had been lost.[1] It was too fragile a device for frontline observation purposes.

Fortunately, the same instrument that had brought about the demise of the balloon now provided a replacement: the fixed wing aircraft. Although the Wright brothers had first flown in 1903 and the U.S. Army had bought its first airplane as recently as 1909, by the end of World War I it had had 39 aerosquadrons in action against the enemy.[2] These had performed "pursuit" (fighter), bombardment and observation missions, all of primitive type, using mostly open cockpit biplanes.

GRASSHOPPERS

But enough had been learned to make it clear that the fixed wing aircraft (helicopters were way in the future) was the device to develop, for observation as well as other missions. When the Army Air Corps was created by Act of Congress in 1926 it began to develop specialized types of aircraft to perform its several functions; for observation a tandem two-seater, open cockpit biplane was generally used. Rather heavy, it required a hard surface runway or its near equivalent. The Air Corps furnished the plane and pilot for observation of artillery fire while the field artillery furnished the observer. Doctrine specified that such observation planes should be attached to corps and from there allotted to subordinate units on a mission-by-mission basis as the situation indicated.

The two branches quickly worked out a suitable technique. During 1930 to 1932, at Ft. Bliss, TX, I was reconnaissance officer of the 82d Field Artillery Battalion (Horse) of the 1st Cavalry Division. My duties included those of battalion air observer. On numerous occasions I went aloft as observer in an Air Corps plane and adjusted artillery fire during target practice at the Dona Ana Firing Range in New Mexico. Adjustments were routinely rapid and accurate, though slowed somewhat by the use of Morse code instead of radio telephone; a suitable set was not then available. (During this experience I became interested in flying and learned to fly at a nearby civilian school. Over the next few years I advanced through several pilot ratings—solo, amateur, private, limited commercial with instrument rating—and I owned two airplanes. I flew often from small fields and strips, gaining experience which was to bear fruit later.)

But, however adequate the technique, there were serious and I think fatal flaws in the arrangement just described:

- The plane furnished was always a fairly heavy type requiring a hard surface runway or near equivalent; it therefore had to be based at an airport or temporary field some distance to the rear, "on call."
- When the call was made (if indeed it was heard) the pilot had first to *find* the guns he was to serve, since the artillery often had moved since the last mission.
- The observer, whether Field Artilleryman or Air Corps observer, was likewise in the dark as to gun position and target location; this had to be worked out by radio after the plane was airborne. It wasn't easy. Of course the observer could be stationed between missions at the guns, and thus have all the information he needed, but the delay due to his travel overland from guns to airfield to begin the mission was unacceptable.
- The overriding deficiency in this system was the limited amount of observation *time* available. There was need for air observation, not merely to fire on some target previously located (located *how*, please?) but to sit up there and *find* targets. Time spent by the airplanes on the ground or flying back and forth between landing area and gun position was a complete loss.

All this was well-known to every artilleryman, and much complaining was done, but little else. The stringencies of peacetime funding plus the natural preoccupation of the Air Corps with what it considered its more pressing responsibilities, strategic bombing and tactical air support, left scant opportunity for improvement in air observation for Field Artillery.

In 1939 war broke out in Europe, and by 1940 military activity in the United States was increasing by leaps and bounds, for it seemed likely that we would eventually be drawn in. (My class at Leavenworth was turned out in January 1940, ahead of the scheduled June, to go to units in field training.) Agitation for better air observation grew in intensity, led by the chief of Field Artillery, Major General Robert M. Danford. This attracted the attention of the three leading light aircraft manufacturers: Aeronca, Piper and Taylorcraft. Aggressive businessmen, they got into the act and placed one or more civilian aircraft with company pilots, at the disposal of every senior commander in every large scale Army maneuver conducted during 1940 to 1941 in Louisiana, Tennessee and elsewhere. Toward the end a veritable squadron of planes was in action during the Desert Maneuvers at Ft. Bliss: eight from Piper and two each from Aeronca and Taylorcraft. The missions performed were mostly courier and command reconnaissance, though there apparently was some adjustment (simulated) of artillery fire.

An amusing incident occurred in the course of the Desert Maneuvers. Henry Wann, one of the Piper pilots, was told to fly to the field headquarters of the First Cavalry Brigade and report to the commander, Major General Innis P. Swift. Wann located the headquarters, landed and reported. General Swift seemed quite impressed. He said, "You looked just like a damn grasshopper when you landed that thing out there in the boondocks and bounced around." Thus "Grasshopper" became the proud title of the early Army aviators.

At this point my 20 years' service as an artilleryman, my modest experience as an air observer, and my 7 years of private flying came into conjunctive focus: Why not make air observation organic to the artillery itself? Each battalion would have its own light plane operating from a nearby field or road, with its own artilleryman pilot and artillery observer, constantly in touch with the battalion fire direction center, constantly and instantly available to the battalion commander.

GRASSHOPPER SQUADRON

Piper Aircraft Corporation
W. T. Piper Sr.
T. I. Case
Thomas Piper
Howard Piper
T. H. Miller
Norman Hockenberry
Henry Kubick
W. D. Strohmeier
T. V. Weld
Forrest I. Nearing*
Robert Bowes
David Cogswell
Gordon Curtis
James Diegel
Robert Heath
J. M. Helbert
C. R. Holladay
J. W. Miller
Henry S. Wann
David Kress*
Jules Parmentier
H. Sheldon Chadwick

Aeronca Aircraft Corporation
Maurice C. Frye
James Rosing
James Kukla
John Gall*

Taylorcraft Aviation
James Ludwig
Paul Yates
Philip Gow*
Adair Miller
Ray Carlson*
Frank Parmelee*

Continental Engine Company
Percy Hubbel*
Chauncey Chantree*

Ground engineers, the others were flying salesmen. John E. P. Morgan was also a member of this group. From Washington, he acted in the capacity of a director or observer.

In the fall of 1940 I wrote an article along these lines, published in the *Field Artillery Journal* of April 1941, recommending organic air observation for Field Artillery. As to the need, I said, in part:

"During the Third Army maneuvers in the early part of 1940 this writer was a battery commander in the light artillery of a "streamlined" division. During successive division, corps and army exercises he participated in a number of field problems. *Not once*, during this period of 4 months, did he find a decent OP! *Not once* did he have a map or map substitute from which fire could have been computed! *Not once* was an actual air observer available to adjust the fire of his battalion!"

As to the feasibility and type of plane:

"The plane for our Field Artillery battalion should go with that battalion at all times. The 'flivver' plane, with its light wing loading and its 75 HP engine, cruises at about 80 mph and lands at about 45 mph. It does not require a prepared landing field, but can land in almost any cow pasture or similar place. Hundreds of landings and take-offs have been made on highways. Even plowed fields are practicable provided the furrows are not deep."

As to vulnerability:

"Objection will be heard that such a craft will be quite vulnerable to hostile aviation. Well, what aircraft isn't? Only the best of the fighters themselves. Does anyone think, for example, that our present service type observation ship, the O-47, would bear a charmed life in an atmosphere infested with enemy pursuit? Of what use are one or two flexible machine guns, firing to the rear, against the eight fixed forward guns of the modern fighter?

"Our little flivver plane will have no armament at all; its protection will consist in:

• General superiority of the air secured by our pursuit aviation. Let no one say we may not have this. We *may* not win the war, but we should try. We should try, likewise, to gain air superiority. No modern war has been won without it. Of course not even a definite air superiority on our part will render us immune from enemy air attack. But such superiority, or merely an equality, should make it possible for us to employ observation aviation without

Some of the members of the test group (above) who helped bring about the birth of Army Aviation and the establishment of the Department of Air Training at Ft. Sill, OK:

Richard H. Alley
Frank C. Baumstark
Lloyd M. Bornstein
Delbert L. Bristol
Joseph R. Caldwell
Felix H. Coune
Roland J. Coutura

GRASSHOPPERS

prohibitive losses, especially if other protective measures are adopted.

- Observing from low-altitudes *over own territory.* Low-flying airplanes, particularly if painted camouflage, are hard to see from above. If enemy fighters *cruise* at low altitudes our ground weapons should be able to make it hot for them.
- Maneuverability. Upon the approach of hostile aircraft our pilot will put the little ship into a series of tight turns, barely off the ground; high-speed enemy fighters, much less maneuverable, will have difficulty in bringing their guns to bear."

Well, what happened? The article in the *Journal* excited much favorable comment; the light aircraft manufacturers placed a dozen or so planes and pilots at the disposal of the senior commanders in the maneuvers of 1941, but not much else took place.

Opponents of the idea claimed, first, that Field Artillerymen couldn't fly these little planes from roads and small fields, they'd break their necks; second, that if they did manage to fly them as proposed, the necessary maintenance could not be performed under primitive field conditions; third, that if it happened by some miracle that the planes could be so flown and maintained, they'd be shot down the first day in battle.

So the "experts" were opposed. The Air Corps was opposed for an additional reason. It had been too long under the tutelage of the Army not to know the uses of bureaucracy and it wasn't about to let air observation slip from *its* hands any more than the Army, some years earlier, in the days of Billy Mitchell, had been willing to let the Air Corps slip from *its* hands to become an independent arm.

Despite this strong opposition, the idea would not die. The commanders who in the 1940 and 1941 maneuvers had been served by the light planes lent by the aircraft manufacturers were enthusiastic in their support. General Danford visited the artillery school in England during the summer, and came away impressed by the efforts being made there to use light aircraft for artillery observation. I talked to him later that fall when he came to Ft. Sill, OK, and was delighted to realize his strong support of the proposal that a test of my theory be made. His staff was plugging for it with G-3 of the War Department, and finally, on 5 December 1941, a formal proposal to this effect was made to the Chief of Staff, General George C. Marshall.

It is doubtful whether the proposition would have gone any further in the absence of a strong push from a new direction. But 2 days later, on 7 December 1941, the Japanese attacked Pearl Harbor with devastating effect. The event caught some of the big brass, military and civilian, with their pants down, and scared the pants off nearly everyone else. People had nightmares of Japanese scaling the cliffs of California. On 10 December the Chief of Staff directed the chief of Field Artillery to proceed with the proposed tests.

I was called to Washington a few days later and worked with General Danford's staff on the details of a directive which he would issue to the commanding general, Ft. Sill, covering the training phase of the program. This directive was issued on 23 December 1941, and on 2 January 1942, I was appointed director of Air Training.

On my way to Washington I had been visited on the train during the brief stop in Cincinnati by Major Gordon J. Wolf, a Field Artillery Reservist, who had heard of the program and wanted to join. He was an enthusiastic private flyer with several years' experience, of great energy, intelligence and imagination. I gladly accepted his offer, and he became my second in command. He contributed outstandingly to the operation.

Lloyd M. Damron
Robert W. Donovan
Edward Drapela
Robert M. Ford
William W. Ford
Marion J. Fortner
Alwin R. Hackbarth
Ralph P. Hage
Chester Hammond
Steve E. Hatch
James W. Hill Jr.
Edwin F. Houser
James T. Kerr
Charles W. Lefever
Robert M. Leich
William R. Matthews
Joseph E. McDonald
Joe L. Messina
Forrest I. Nearing
Thomas F. Piper
Alanson Rawdon
Lawrence E. Rhodes
William T. Roulston Jr.
John S. Sarka
Theodore F. Shirmacher
Thomas M. Skelly
Stanford J. Stelle
David Sweetser
Paget W. Thornton
Henry S. Wann
Robert R. Williams
Bryce Wilson
Gordon J. Wolf
Walter J. Zimmerman

Incredibly, on 15 January 1942, actual training for the tests began. That so much had been accomplished in a scant month is explained only by the heroic efforts of all concerned under the impetus of war.

Arrangements had been made as follows:

- The chief of Army Air Corps had turned over Post Field, Ft. Sill, for use in the project; had furnished 24 Piper Cub airplanes (commercial J-3s painted olive drab) and associated equipment; and would supply 80-octane aviation fuel.
- The chief of Field Artillery had sent circulars to all field artillery units in the United States, inviting applications for participation in the test from officers and enlisted men having civilian pilot licenses with private pilot or higher grade. Fourteen officers and 19 enlisted men were thus selected and they reported to Ft. Sill for training.[3]
- The Civilian Aeronautics Administration (CAA) lent Mr. Richard Alley to serve as chief flight instructor, and Mr. Stanford J. Stelle to serve as maintenance supervisor. It also recommended seven flight instructors of extensive experience in the type of flying contemplated. These instructors were hired by the Field Artillery School and served throughout the training period prior to the field tests. Included in their number were two, Tony Piper and Henry Wann, who had been active as pilots for the light aircraft manufacturers in the maneuvers of 1940 and 1941. Both of them, and Ted Shirmacher, another of the civilian flight instructors, obtained commissions and continued as military pilots throughout the war.
- The aircraft and engine manufacturers sent experienced people to assist: Mr. Forrest I. Nearing from Piper, and Mr. Chester Hammond from Continental.

It was a piece of cake. Probably no military group ever began a war mission with greater joy and enthusiasm. For here was an opportunity not only to serve their country in a highly promising war effort, but to do so while getting their fill of what they liked best to do—flying. Whereas flying hours had previously been limited due to their costliness, they were not bountiful and free.

The course laid out by Mr. Alley and Mr. Stelle under my direction was to last from January 15 to February 28. After that would come the field tests. One-half of each day would be spent in flying; the other half in maintenance, for we were training pilot-*mechanics*. The pilot had to be prepared to do all the usual day-to-day maintenance in the field. As far as practicable each pilot was assigned a specific airplane, which was exclusively his to fly and maintain. The CAA skilled flight and maintenance instructors were all over the operation, giving dual instruction, check rides and examinations in both subjects.

It was the flying, of course, which was the most unorthodox. In their previous civilian training these pilots had been taught to fly only from fields large enough to provide a generous margin of safety against misjudgment in landing and takeoff. They had been taught to maintain, except at the final moment of landing, a speed well above stalling. And they had been required to fly at an altitude high enough to provide reasonable safety in case of engine failure.

Now all this was changed. They were to fly "low and slow," formerly a prescription for trouble. Flying low was to provide some protection against hostile aircraft. Flying slow, during the approach for landing, was to permit them to get into the smallest possible field or strip, since any excess speed would risk overshooting and cracking up. The fields to be used were to include, ultimately, those of smallest negotiable size and barest acceptability as to surface; the roads with smallest tolerable clearance as to wires, trees, telephone poles, fences and similar obstructions.

What fun it was! Like defying the law of gravity. Daring to do what you had been told, up to now, never, never to do.

But this was no foolhardy enterprise, no exercise in recklessness. We began by practicing this new style of flying under conditions where the dangers were only simulated. We began on practice fields and strips as large and as smooth as many small airports. We put up, at the approach end of the landing strip, two bamboo poles about 20 feet high, with a string bearing short streamers stretched between their tips. The pilot's job was to come in over this simulated obstruction in a delicately controlled power-stall approach and land as short as possible, braking hard if necessary. If he overshot, being too high or too fast, there was still plenty of field left on which to make a landing. If he came in too low the only damage was to the string and streamers; if too slow, he might "stall out" and have a hard landing, possibly washing out the landing gear but nothing more. Actually, not a landing gear was lost.

After several hours of this, when the pilots had acquired a feeling of confidence in the power-stall approach and a fairly good feeling for what size field was acceptable, the scene shifted to smaller fields and roads. Nothing was simulated here; the obstructions were real. Landings on roads presented no problem except in crosswinds or where obstructions such as trees or telephone poles were too close to the road. In that case a less hazardous stretch of road was sought. After more experience a pilot skilled in this technique could even land on a curving road with confidence. The trick was simply to fly around the curve, banking just enough under part throttle to stay over the center line of the road, then settling gently to a one-wheel, tail-high landing. As soon as the landing roll was stabilized on one wheel, following the curve, the outside wing was lowered until the outside wheel touched the ground. Rudder control was then sufficient to keep the desired direction until, with throttle closed, the tail dropped gently, the steerable tail wheel touched, and the aircraft was braked to a stop.

During the latter part of this short-field work our "evasive maneuver" was introduced. Upon observing the approach of hostile aircraft the pilot was to roll into a dive, aiming for the ground. The hostile pilot could not follow this maneuver because of his much greater speed, and would thus be thwarted. Our pilot, having rolled into the dive, would immediately begin a gentle pullout, lest a dangerously high airspeed be built up, which might take him into the ground or cause him to lose a wing in pullout. Little training was required for this maneuver. In the production aircraft for field use the observer would be seated facing to the rear, with large plexiglass window areas giving him a good field of view for detecting the approach of hostile aircraft.

In the beginning the pilots had been given a review of basic flying maneuvers, lasting about 10 hours. Several were dropped from training during this period, due to lack of aptitude or unsatisfactory rate of progress. Then, after some 20 hours or so of practice on small fields and roads, came the third and final phase: the actual conduct of fire. The splendid Ft. Sill firing ranges were made available, along with well-trained firing batteries and skilled fire direction centers (FDCs). The observer, having conferred with the FDC as to the mission to be flown, would go to his plane nearby, the plane would take off at once, and as soon as the target area was in sight the command to fire was given. Adjustment would be rapidly concluded and the plane would land. The average time achieved, from takeoff to landing, was about 9 minutes. This was for personnel in training; skilled pilot-observer teams sometimes did it in as little as 6 minutes. During this part of the training the observer was usually a second pilot in the

Flight A at Camp Blanding, Florida, April 1942

Flight B at Pershing Field, Ft. Sam Houston, TX, April 1942

aircraft; but in the field the observer would be a junior officer in the Field Artillery unit served, he having been already well-trained, at Ft. Sill, in the conduct of fire.

The War Department had directed that the training phase at Ft. Sill be completed by 28 February 1942, after which the real tests, in the field, would be conducted. So it was. In less than 3 months since Pearl Harbor there had been assembled, trained and made ready a unit prepared to demonstrate the capability of an entirely new kind of military aviation.

Of the 14 officers and 19 enlisted men who reported for this training, 3 officers and 10 enlisted men failed to complete the course. Probably there would have been fewer failures had the course been not so condensed. The average flying time at the beginning of the course was, for officers, 187 hours; for enlisted men, 70. This explains the disparity of results between the two groups. The average number of hours flown during the course by students completing same was 39. Enlisted pilots completing the course were immediately promoted to staff sergeant.

There were no accidents! Well, no *serious* accidents.

On 28 February 1942, the training detachment, later to become known as the Class Before One, was divided into two groups: Flight "A," consisting of 11 airplanes and 14 officers and men, to go to Ft. Bragg, NC, for service test with the 13th Field Artillery Brigade; Flight "B," consisting of 10 airplanes and 14 officers and men, to go to the 2d Infantry Division, Ft. Sam Houston, TX, for the same purpose.[4] I was not a member of either group, although I led Flight A on the flight to Ft. Bragg and remained there as observer and consultant for most of the test period, then moving to Ft. Sam Houston for the same purpose.

The field tests were to be made with troops actually on maneuvers, where the utility and practicability of organic air observation for field artillery could be assessed. A new element was now introduced for evaluation: the vulnerability of these small planes to hostile aircraft. Actually this was the only element in doubt. If the little planes could live in battle, there was no doubt that they could operate from landing areas or roads *somewhere* near the guns they served; there was no doubt that they could maintain the planes in operational condition; there was no doubt that they could bring fire, unerringly, upon any target within range of the guns, and this by staying over our own lines, out of reach of enemy ground fire. But what about hostile aircraft? We hoped that the evasive maneuver previously described would neutralize this danger.

Shortly after Flight A arrived at Ft. Bragg, the 13th Field Artillery Brigade moved to Camp Blanding, FL, where the actual tests were to be run. Flight A went along, finding an acceptable landing strip on a sandy lane in the pines near brigade headquarters. An Air Corps fighter squadron, based nearby, was designated to furnish the air opposition. Flying P-39s equipped with gun cameras, they were to take pictures of our Cubs in the air, thus proving the Cubs would be shot down while flying their observation missions, and on the ground, proving that our attempts to hide planes under trees while not on missions were ineffective.

We were worried about this. Not only at the prospect of having some high-speed fighter whiz by you a few feet away (suppose he miscalculated?), but more so at the thought that he had just taken a picture of you as he shot you down. These pictures might convince higher authority that our whole scheme was impractical.

A bright idea occurred to us. If he wanted to play at shooting us down, why shouldn't we play at shooting him down? Not from our plane, of course, which had no guns, but from the ground? All the artillery units underneath us were generously equipped with machine-guns for defense against low-flying aircraft as well as against ground attack. Why not equip each machine gunner with a camera to "shoot down" (that is, take the picture of) any hostile plane that pursued a Cub so low as to present a good target? This would render the picture war a stalemate. This was done, and the game was entered into with enthusiasm by all concerned: the fighters, the Cubs, the men on the ground. The ultimate in evasive maneuver by a Cub pilot was reached one day when Lieutenant Couné came in from a mission with a section of pine tree about 3 inches in diameter and 3 feet long stuck in the leading edge of his right wing. Attacked by a fighter, he had barely pulled out of his evasive dive when he flew through the top of a pine tree, clipping off a piece. The plane was repaired in the field and remained in service.

Brigadier General Mark Clark came by to have a look at all this, and I took him for a ride from a secondary road with pine trees close to our wing tips on both sides. We landed on the same strip. He seemed favorably impressed.[5]

After a few weeks at Camp Blanding I went to Ft. Sam Houston, where Gordon Wolf was leading Flight B through a highly successful test with the 2d Division. The field tests at both places were soon over, and enthusiastic reports from both generals concerned went on their way upward through channels to Headquarters, Army Ground Forces. A curious thing happened here. Lieutenant General Lesley J. McNair, who commanded the Ground Forces all over the United States and did a magnificent job of training them, was away on an inspection trip at the time and his Chief of Staff, General Clark, who had flown with

me, was in charge. Ever willing to take responsibility, General Clark promptly approved the reports and sent them up to the War Department Chief of Staff, General Marshall, recommending that organic air observation for Field Artillery be adopted as standard. The War Department approved. It was rumored that General McNair, upon his return, was somewhat displeased at this precipitate action. I asked him later about this, believing that having served under him at Purdue ROTC I had his confidence. I asked him didn't he believe we could do what we claimed we could do. He said oh, yes, he believed the concept was sound but that the Air Corps, being the traditional operator in the flying domain, should have been allowed to handle it if it wished. However, he made no effort to undo what had been done. He and General (Hap) Arnold, chief of Army Air Forces, were very respectful of one another's prerogatives.

So it came about that on 6 June 1942, a War Department directive established "Organic Air Observation for Field Artillery," allotting two planes, two pilots and one mechanic to each field artillery battalion, and the same to each group, division artillery and corps artillery headquarters. It was wealth beyond our wildest hopes.

A Department of Air Training was instituted at the Field Artillery School. I was appointed director, and most of the personnel who had been in the test group remained as members of the initial staff. The course of pilot training was refined and somewhat extended, and training of mechanics was begun on a corresponding scale. When the supply of persons already holding civilian pilot licenses gave out, the Air Corps contracted with civilian flying schools to fill this need. Volunteers from all over the Army were first given primary training at the civilian schools, coming later to Ft. Sill for advanced and special training. It was a great satisfaction to those of us who had been the pioneers in this activity that, although starting from scratch after the war began, it developed fast enough to supply each Field Artillery headquarters entering combat in any theater of operations its organic air section.

That, then, is how Army Aviation got its start, though under another name. How it went on in World War II to fulfill richly the predictions which had been made for it; how it came to serve many needs beyond those of the Field Artillery; how it came to employ a new type of aircraft, the helicopter; how it proved itself over and over in two more wars; how it stands today in robust maturity and is still developing—these are chapters in a remarkable story for which there isn't the beginning of enough space here. Some other time; some other reporter.

Anyone who makes bold to write for the information or entertainment of other people ought to be able to scrape up as a parting shot some bright thought, some gem of wisdom. I give you the words of Tom Jenkins, who was wrestling coach at West Point a long time ago. His maxim was: "There ain't no holt what can't be broke." It is as true in military science as in wrestling, whether you are making the holt, or breaking it.

References

[1]*The Army Aviation Story*, by Richard Tierney, Colonial Press, 1963, p. 24.
[2]*ibid.*, p. 38.
[3]*ibid.*, pp. 54-56.
[4]*ibid.*, pp. 57-58.
[5]*ibid.*, Introduction, General Mark Clark's postwar comments on the little planes.

Pilots of the Grasshopper Squadron at a reunion in October 1978 at Ft. Sill are left to right: John Sarko, Robert Williams, Gordon Wolf, Randy Matthews, James Kerr, Charles Lefever, Tony Piper, Robert Cassidy, William Ford, Bryce Wilson, Padget Thornton, Henry Wann, Delbert Bristol and James Hill

Flight to ARIZPE

Army Aviation's reputation as a good neighbor to civilian communities is well established. An international mission 19 years ago helped build that character

Colonel Richard E. Mackin
Assistant Chief of Staff/Deputy
Installation Commander
U.S. Army Aviation Center
Fort Rucker, AL

Loading of the aircraft at Crissy Army Airfield, 26 May 1963

IN MAY 1963, I was assigned to the 17th Aviation Company at Ft. Ord, CA. The company was equipped with the U-1A Otter, a fixed wing aircraft which was produced by de Havilland of Canada. It was a strange looking beast even then, with its strut-supported main landing gear and its seemingly outsized verticle stabilizer. It could carry, depending on the fuel load, 11 people, at least one of which had to be a pilot. The empty weight was about 5,000 pounds, and it had a maximum gross weight of 8,000 pounds which was frequently exceeded. With a full load of fuel, 212 gallons as I recall, the Otter could fly at a speed of 105 knots for more than 6 hours. In any event, the Otter could carry 3,000 pounds of a suitable combination of fuel, crew, cargo and passengers. I might add that the whole affair was propelled by a single Pratt and Whitney R-1340 engine and its forte was operating into and out of very short, unimproved areas.

At this point in time I was relatively free of responsibilities, having just been replaced as the company operations officer due to my impending reassignment to the Infantry Officer's Advanced Course at Ft. Benning, GA. Thus, when a strange mission was received from the Sixth Army Headquarters, Presidio of San Francisco, I was a likely candidate, as a captain, to be the mission commander.

The initial order received at the 17th Aviation Company was to send two Otters to Crissy Army Airfield, Presidio

of San Francisco, Sunday, 26 May 1963, for a mission which would involve a flight into Mexico. Further instructions would be provided later. If possible, we were to bring two Spanish speaking crewchiefs. We did as instructed, arriving at Crissy shortly after noon Sunday. Later that day, we were briefed by the Sixth Army public affairs officer who told us the background of the mission and exactly what must be accomplished. The crews of the aircraft were myself, then Captain Richard E. Mackin, Captain Robert B. Galusha, First Lieutenants Clifford Fremstad and Ted L. Rogers and crewchiefs Specialists Five Jamie Restrepo and Fernando Vargas.

According to the PAO, the priest in Arizpe had accumulated sufficient funds to have a new floor constructed in his church. In the process of removing the old wooden floors that had been installed, one on the other, over the years, he exposed the graves of the various dignitaries who had been buried under the floor of the church. One of the graves the priest knew to be that of Juan Bautista de Anza (1735-1788), a Spanish explorer and governor in North America who founded Monterey and San Francisco. Apparently feeling that the final resting place of such a famous man should be recognized in some way, the priest wrote the Mexican Government. On receiving no response to the letter, the priest wrote the governor of California, Governor Pat Brown. Governor Brown sent the letter to the University of California and thereby started a chain of events which led to the city of San Francisco getting involved. There was an exchange of delegations between San Francisco and Arizpe, resulting in the commissioning by San Francisco of the fabrication of a marble sarcophagus. Further, the city requested assistance from the Sixth Army commander to get the coffin delivered.

Initially, it was expected to use UH-1 helicopters to do the job, but aviation staff officers pointed out that the distance involved, along with the lack of JP-4 fuel—or any other aviation fuel—at Arizpe, made the use of the Hueys impracticable. Obtaining Marine Corps CH-34 Sikorsky helicopters or de Havilland CV-2 Caribous from other commands was also considered. Desiring to accomplish the mission with its own assets, however, Sixth Army's attention turned to the 17th Aviation Company with its slow, but sturdy Otters.

Our mission was to depart Crissy Army Airfield at the Presidio on Monday, 27 May 1963, with 2,700 pounds of sarcophagus split between the two aircraft. We also were to carry an Army photographer. The aircraft were to land at Arizpe, Mexico, at 0900 hours Wednesday, 29 May, and be out of Mexico by 1500 hours that same day. How we did it was up to us. Allegedly, customs in both Nogales, Mexico, and Nogales, AZ, were aware of our coming.

We started early Monday morning with the loading of the disassembled sarcophagus, using forklifts to bring the heavy pieces to the height of the aircraft doors, then man-handling them forward to keep the center of gravity of the aircraft within acceptable limits. After that was completed, each aircraft commander did his weight and balance computations, considering the weight and location of the marble slabs (some weighing 700 pounds), the same for passengers and crew, and sufficient fuel with reserve to take us to Bakersfield, our first stop. While the results of our figuring were marginally acceptable, we were faced with a takeoff from Crissy to the west with a quartering headwind. I must point out that immediately west of that airfield sits the Golden Gate Bridge. At 1115 hours, after some cargo adjustments between aircraft and with TV cameras rolling, the ungainly birds lumbered down the runway with all resting on the skill of the aircraft and engine makers. Clearing the southern approach of the Golden Gate with at least 50 feet to spare, we slowly turned south. We refueled in Bakersfield and went on to spend the night in Phoenix.

Tuesday we flew to Ft. Huachuca, AZ, where we planned our next day's flight so as to, first, find Arizpe, and second, to arrive there at 0900 hours. Our maps showed Arizpe to be around 100 statute miles generally southeast of Nogales, Mexico. There was an airfield indicated on the map but there was no tower nor any services listed. Other than a commercial radio station in Nogales, there were no navigational aids; however, there were some good terrain features and the weather was forecast to be excellent, so we didn't anticipate any problems. We again computed our fuel requirements so as to carry only what was needed. Not knowing what the strip at Arizpe consisted of, we wanted to be as light as possible.

Wednesday the two aircraft left Ft. Huachuca at 0645 hours and landed at Nogales, Mexico, at 0715 hours. Of course, the Mexican Customs had no idea what the two funny looking U.S. Army aircraft were doing inside Mexico. Fortunately, a Cessna, chartered by the Sixth Army public affairs officer, showed up shortly after we did and that officer, who spoke Spanish, explained the mission and cleared our way. At roughly 0850 the two Otters arrived over the Arizpe Airfield. It turned out to be a flat clearing in the sparse bush that made up the countryside. For some reason, best known to others, the Arizpe airstrip is the only one I have ever seen with a dogleg in the runway. We easily had 700 to 800 feet of usable dirt strip, however, so there was no great challenge offered for the Otters.

At approximately 0856, I started my approach. I instructed the other aircraft commander to stay airborne until I was safe on the ground and clear of the runway. At 0900 hours, or close thereto, the first Otter touched

At the airfield in Arizpe, Mexico (above), a school teacher and her class waited to inspect the aircraft. The church in Arizpe (right) showing the future resting place of Juan Bautista de Anza, with standing, left to right: LT Rogers, the charter pilot; SP5 Restrepo; CPT Mackin; LT Fremstad, CPT Galusha; SP5 Vargas; unknown citizens of Arizpe. In the hole, the Padre and the mason

down at Arizpe, followed shortly thereafter by the second. We parked the aircraft side by side, put on our ties and jackets, and dismounted. Off in the distance, toward the city, we saw pickup trucks, sedans and people on horses all in a convoy, heading for the airfield. The Cessna landed just ahead of the convoy's arrival.

Many of the people from Arizpe spoke English; and when that wasn't the case, either another citizen translated or one of our crewchiefs stepped in to help. Among the people we met were the priest, the mayor of the town, and a representative of the governor of the state of Sonora. In addition to the aircraft crews the only other people on the scene from the United States were the Cessna pilot, the Army photographer, and a mason from the company that fabricated the sarcophagus who had also arrived via the Cessna.

Having seen the effort that went into loading the marble slabs in San Francisco, it was with awe that I watched the Mexican men, under the supervision of the priest, unloading them. They backed their trucks up to the cargo doors and as many strong arms as could get to the heavy pieces would gently and carefully carry them out. The whole operation took only minutes and was executed without a scratch to the aircraft or damage to the marble.

At approximately 1100 hours, after the mayor had established a guard on the aircraft, the crews were assigned to sedans for the trip to town and church.

Frankly, I don't remember much about the church other than it was fairly large and had a number of side altars with numerous statues. The new floor project was almost complete with only the finishing yet to be accomplished. The coffin containing the remains of Juan Bautista de Anza was placed on the floor, off to the side of the main altar. I presumed that the other bodies of distinguished people who had been buried under the floor of the church had been left in place. The new, and hopefully permanent site for de Anza was a bricked-in hole in the floor, awaiting the marble from San Francisco and, of course, awaiting de Anza.

After lunch, along with a sizeable entourage, we returned to the airstrip where we performed the normal preflight inspection of the aircraft and then took off from Arizpe. The two aircraft joined in what for Otters approximated a formation and made a low pass over the airfield with much waving of hands both on the ground and in the planes. Following a short stop in Nogales the flight cleared Mexican airspace at approximately 1455 hours.

Equipped by nature with one of the world's worst memories, I have attempted to recount the events of that mission to Arizpe some 19 years ago. While much of the detail has faded, I clearly remember the feeling that we had done something that was worthwhile and that on 29 May 1963, in Arizpe, Mexico, the United States looked good in the eyes of the folks of that little town—and I was proud to have been part of it.

A Detailed History of the U-21

Lieutenant James R. Dobson, U.S. Navy

The Army's first production model U-21A at the Beech factory, 1967

NU-8F (YU-21) prototype for U-21

A U-21, IS THAT a King Air or a Queen Air? A question frequently asked by civilian pilots, as well as military pilots from the other services. Federal Aviation Administration (FAA) air traffic controllers are usually puzzled by the identifier U-21. They call it anything from an Army King Air, to a Queen Air, to an Army Twin, and in lieu of anything else, simply call it an Army aircraft. The U-21 has turbine engines like a King Air, but civilian pilots are baffled by the square Queen Air windows which indicate the U-21 is not pressurized.

So, is the U-21 a King Air or a Queen Air? Actually, it is a combination of both. The U-21 is a cross between Beech Aircraft Corporation's King Air and Queen Air. It has King Air wings and engines and a fuselage similar to that of the Queen Air. The Beech model number 65-A90 further indicates the combination of both King Air and Queen Air. Civilian King Air pilots call the U-21, "A cheap imitation King Air."

The U-21 evolved out of the Beech stables from an already well developed line of twin engine utility aircraft. In 1952, the Army acquired its first twin engine airplane, the Beech L-23 (later designated U-8D), the military version of the Beechcraft model 50 twin Bonanza. The L-23 led to the development of the L-23F (later designated U-8F) the military version of the Beechcraft model 65 Queen Air.

The most radical change in the F model was the seating arrangement. It had a wider, deeper and longer fuselage with four deluxe seats that fit behind the pilot's compartment. The first U-8F was flown on 28 August 1958. One of the most outstanding features realized of this aircraft was its growth potential. With its existing fuselage, wings and tail, it could be fitted with turboprop engines and pressurized. Beech already had visions of developing a pressurized twin engine turboprop which would be called a King Air 90.

U.S. Army U-21F

In 1963, Beech converted for the Army an unpressurized Queen Air model 80. Beech added Pratt and Whitney PT6A-6 turbine engines rated at 550 shaft horsepower each. The Army designated the aircraft as an NU-8F, thus becoming the Army's first turbine powered airplane. Little did the Army know that it had opened up a door for Beech that would result in a multibillion dollar growth explosion.

In early 1964, the U.S. Army Aviation Test Board, Ft. Rucker, AL, received the NU-8F for a 3-month comprehensive evaluation before placing the aircraft into regular Army service. The NU-8F (later designated a YU-21), serial number 63-12902 is still flying in 1982. The aircraft, almost 20 years old now, is assigned to the U.S. Army Test and Evaluation Command (TECOM).

On January 1964, Beech first flew its new pressurized King Air model 90, thus beginning a new revolution for Beech that would spread like wildfire in developing the King Air series.

After successful testing and evaluating the NU-8F, the Army decided on a production design for its new utility transport aircraft. The production model aircraft were designated as U-21As. The U-21A engines are PT6A-20 also rated at 550 shaft horsepower. Beech also switched to the -20 engines on their King Air model A90.

The U-21A was produced by combining the Beech King Air and Queen Air. The purpose in combining the two aircraft was to get the features most needed by the Army from each aircraft. The turboprop engines give the U-21A power and reliability. The King Air wings provided the lift needed to match the engines, and the Queen Air fuselage provided the roominess needed to carry troops and cargo. The U-21A looks very much like the NU-8F. The major difference in the looks of the two aircraft is that the U-21A has only two cabin windows on the left side because of the addition of a cargo door forward of the regular airstair cabin door. This gave the U-21A an overall cargo entrance space of 53½ inches by 51½ inches.

The interior arrangement of the U-21A allows for a variety of uses. The pilot and copilot sit side by side and are separated from the main cabin by a removable half-curtain. The cabin will accommodate 10 combat equipped troops on center facing bench seats, 6 on the right side and 4 on the left. An alternate ambulance arrangement will accommodate three litter patients plus three ambulatory patients or medical attendants. As a staff transport, it will carry six passengers in standard forward-facing chairs.

With all passenger seats removed, the cabin can hold 3,000 pounds of cargo. Cargo tiedown fittings are installed in the floor and are capable of restraining 2,000 pounds. Usable cabin space is 55 inches wide by 57 inches high and 12½ feet long. The floor is designed to withstand cargo loads of 200 pounds per square foot. Bulk cargo is easily loaded through the cargo door 53½ inches wide by 51½ inches high.

The Army awarded the Beech Aircraft Corporation an initial contract of $17,631,081 for 88 U-21As. The Army took delivery of the first production model U-21A on 16 May 1967 at the Beech factory in Wichita, KS. Additional contracts were later awarded for several different models of special electronics mission aircraft (SEMA).

When the U-21 production ended in 1971, 7 different models had been built totaling 162 aircraft. An additional five King Air model A 100s were procured in 1971 and designated U-21Fs, and three Super King Air model 200s were purchased in 1974 and designated as RU-21Js. This brought the total to 170 U-21 aircraft procured.

continued on page 18

The following is a list of the total number of U-21 aircraft built for the Army:

U-21A

102 built

JU-21A

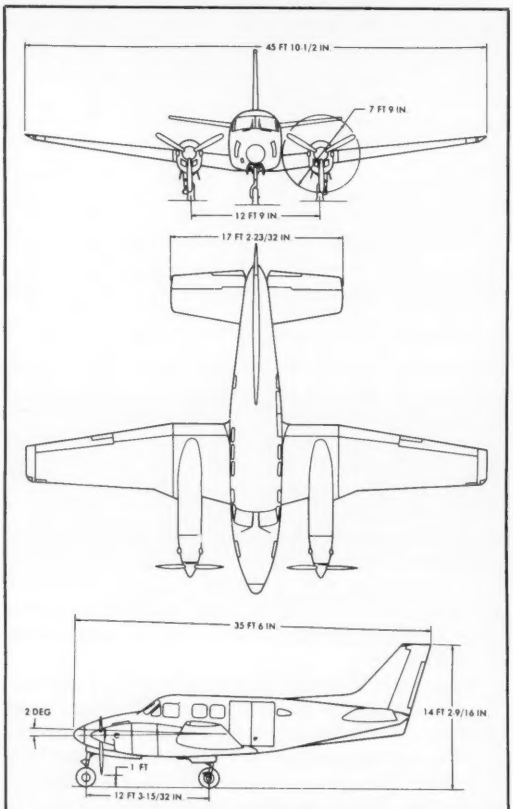
These three aircraft (serial numbers 67-18063, 67-18065, 67-18069) were built as U-21As. They were specially modified and redesignated JU-21As for the electronic warfare LEFT JAB Program.

RU-21A

4 built (67-18112 through 67-18115)

RU-21B

3 built (67-18077, 67-18087, 67-18093)



U-21A, RU-21A, U-21G, RU-21D, RU-21E

RU-21C

2 built (67-18085, 67-18089)
RU-21B and RU-21C models are five specially built electronic warfare aircraft for the CEFIRM LEADER Program. (For additional information on the JU-21A, RU-21A, RU-21B, RU-21C, see April 1981 *Aviation Digest* and January-February 1981 *Army Aviation Association of America* magazines.)

RU-21D

18 built (67-18104 through 67-18111, 67-18119 through 67-18128)

RU-21E

16 built (70-15875 through 70-15890)

U-21G

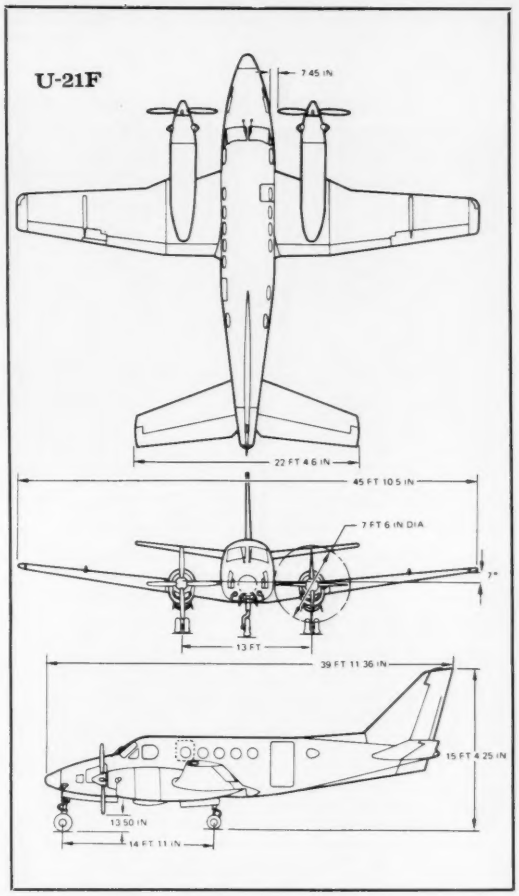
17 built (70-15891 through 70-15907)

Beech built a total of 162 U-21 aircraft (excluding the F and J models). The U-21F and the RU-21J were specially procured aircraft and were designed as U-21s.

RU-21J

3 built (71-21058 through 71-21060)
In 1972, Beech produced two prototype T-tail Super King Airs. FAA certification was obtained on 14 December 1973. In 1974, the Army took delivery of the first three production model Super King Air 200s off the assembly line. The Army designated these aircraft as RU-21J models. These Super King Airs are fitted with standard PT6A-41 engines rated at 850 shaft horsepower. The RU-21J looks identical to the Army's C-12. The three aircraft were configured with various types of electronic warfare equipment and an array of antennas. After several years of serving as a test platform, the RU-21Js were stripped of their electronic gear and configured for the VIP transport role.

RU-21J



U-21F

5 built (70-15908 through 70-15912)
The last U-21 contract awarded to Beech was for 22 U-21G models. However, in 1971, the Army changed the contract to 17 U-21Gs in order to purchase 5 of Beech's new King Air model A 100s. These were off the shelf civilian version aircraft and the Army's first pressurized aircraft. The Army designated these aircraft as U-21F models. However, the only thing military about these aircraft is the OD and white paint job. These aircraft have PT6A-28 engines rated at 680 shaft horsepower, and four-bladed props. The U-21F looks somewhat like the Army's new C-12, but with a straight tail similar to the standard U-21 models.

170 total U-21s built for the Army

When the Army originally contracted for the U-21, it was with the anticipation of acquiring a versatile and reliable utility transport aircraft that would give many years of service. The U-21 has far exceeded all of its expectations. It has proven itself well and will surely continue to be a work horse for many years to come.

Since the U-21 was first acquired in 1967, it has had very few modifications performed, unlike many other military aircraft. Even though most U-21s in the utility fleet today have been configured with VIP interiors to provide more comfort to the passengers, the aircraft itself is still the same basic airplane as it was the day it rolled off the assembly line. One of the most reliable aspects of the U-21 and probably the dominant one is the engines. The Pratt and Whitney PT6A turbine engines have certainly exceeded their expectations and have become the standard turbine engine used on a dozen or more different military and civilian aircraft today.

In keeping up with today's technology and the latest state-of-the-art in avionics, the Army has approved a U-21 Avionics Update/Retrofit Program. This new update was approved for the King Radio Corporation's installation of a complete new avionics package. The installation includes a relocation of existing engine instruments and gages into a vertical arrangement similar to the U-21G model and civilian model King Airs. Some of the features of the King avionics package include digital dual COMMS, dual NAVS with RNAV, flight director and autopilot.

In addition to the new avionics package, a new Bendix ANP 215 color weather radar has been purchased by the Army for installation in all U-21 aircraft. More than 50 percent of the U-21 fleet already has the new radar installed. One advantage of the new avionics package is a weight reduction of about 268 pounds, thus giving the U-21 a greater payload.

The U-21 is 15 years old now. It has served its purpose well and still has many more years of service left. So as the U-21 continues to soldier on, civilian pilots and air traffic control personnel will still ask that question, is that a King Air or a Queen Air?

RU-21H

All RU-21H model aircraft are remanufactured RU-21D, RU-21E and U-21G models. These are special electronics mission aircraft (SEMA). Currently the Army has 21 RU-21H models in the SEMA fleet.

As of March 1982, these are the U-21 aircraft that have been lost or destroyed:

U-21A

66-18002
66-18003
66-18007
66-18012
66-18022
66-18026
66-18028
66-18035
66-18039
66-18041
66-18045
67-18081
67-18086
67-18095
67-18101

JU-21A

67-18065

U-21D

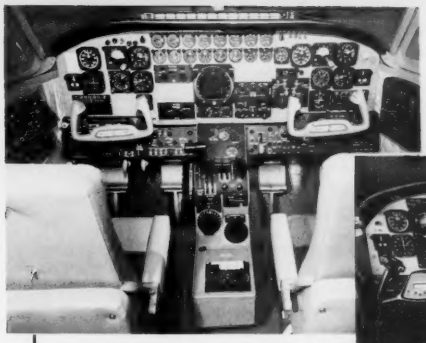
67-18106
67-18125

RU-21E

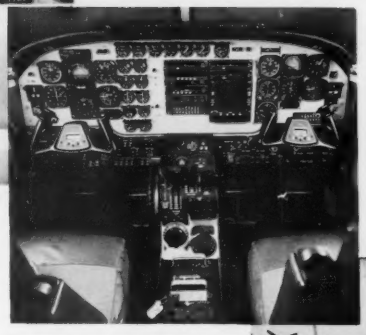
70-15890
(Destroyed in hangar fire at Ft. Bliss, TX, 1975)

About the Author

At the time this article was written, CPT James R. Dobson was the fixed wing platoon leader, 18th Aviation Company (Corps), Ft. Bragg, NC. He has since left the Army and is now a lieutenant in the U.S. Navy. LT Dobson may be contacted through Editor, ***U.S. Army Aviation Digest.***



Original U-21 panel (left) and redesigned panel (below)



Redesigned U-21 panel

THE AVIONIC'S UPDATE/ RETROFIT program for the Army's U-21 has resulted in a panel which is 268 pounds lighter in weight but "heavier" in ease of operation. It offers the flight crew dual comms with displayed active and standby frequencies for easy access to four frequencies; and dual navs with 9-waypoint, TACAN-based RNAV and displayed active/standby nav frequencies. The fully integrated flight control system features pilot's 4 inch flight director and horizontal situation indicator with separate and independent artificial horizon and HSI for the copilot. In addition to standard operating modes, the KFC 250 flight director and autopilot includes yaw damper and altitude preselect and alerting, along with a servoed, encoding altimeter.

The manufacturer uses the latest in state-of-the-art in microprocessors and LSI technology to assure the avionics have increased reliability. That results in a higher mission completion rate, more flexible mission capability, less time for crew qualification, higher payload and greater dispatch ability. (King Radio Corporation)

Avionics Retrofit at the King Radio Factory, Olathe, KS

The following is a list of all U-21 aircraft in service today:

Active Army, Utility Aircraft

U-21A	75
U-21D	8
U-21G	8
U-21H	6
U-21F	5
U-21J	3

Active Army, Special Electronics Mission Aircraft (SEMA)

RU-21H	21

The Army has three electronic warfare companies with seven RU-21H aircraft each

U.S. Army National Guard Aircraft

U-21A	8
U-21D	2

U.S. Army Reserve, Utility Aircraft

U-21D	3

U.S. Army Reserve, SEMA Aircraft

JU-21A	2
RU-21A	4
RU-21B	3
RU-21C	2

REPORTING FINAL

Late News From Army Aviation Activities

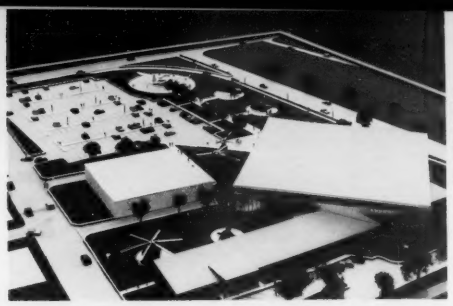


photo by SP5 Phil Tegtmeier

A southeast view of a conceptual design of the proposed Army Aviation Museum at Ft. Rucker, AL, shows the intersection of Andrews Avenue and Headquarters Road in the center background, with Andrews being at the top of the picture. This model was part of the promotional presentation by the architectural firm, H. J. (Jack) Mizell Architects of Ozark, AL, which was selected by the Army Aviation Museum Foundation, Inc., to design the new museum building.

FROM FORT RUCKER

Reassignment. On 2 July, Brigadier General Richard D. Kenyon will assume the position of director of weapons systems, Office of the Deputy Chief of Staff for Research, Development and Acquisition, Washington, DC. He has been deputy commanding general of the Army Aviation Center since July 1981.

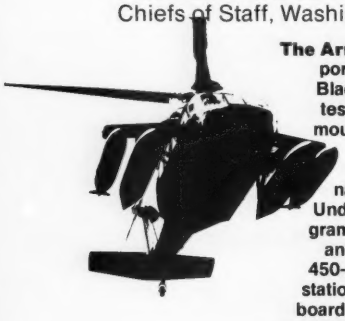
A 1957 graduate of the U.S. Military Academy, West Point, NY, who received his aviator wings in August 1958, General Kenyon came to Ft. Rucker from Washington where he was deputy director of requirements and Army Aviation officer, Office of the Deputy Chief of Staff for Operations and Plans, DA.

His successor in the deputy commanding general position is slated to be Brigadier General Charles E. Teeter, assistant commander, 2d Infantry Division, Korea. **(USAAVNC PAO)**

FROM FORT HOOD

New Commander. Major General John W. Woodmansee Jr. assumed command of the 2d Armored Division on 22 June. He came to his new position from Europe where he was commanding general, V-Corps, USAREUR, and was the ranking Army aviator.

He succeeded Major General Richard L. Prillaman who is now with J3 (Operations), Joint Chiefs of Staff, Washington, DC.



The Army's new external stores support system (ESSS) for the UH-60A Black Hawk helicopter is now being tested. The ESSS consists of wings mounted on each side of the aircraft that can carry four auxilary fuel tanks or a variety of other externally mounted tactical equipment. Under the current development program, the Army will qualify the ESSS and the external fuel system of two 450-gallon tanks on the inboard wing stations and two 230-gallon tanks outboard. Using the four tanks results in a significant extension in range capability, making the aircraft with a crew of three self-deployable. (TSARCOM PAO)

FROM FORT HUACHUCA

Controllers To Stay Awhile Longer. Permission has been granted for 53 Army air traffic controllers now working at various Federal Aviation Administration facilities around the United States to remain in those FAA jobs beyond the expected ending date of 31 August.

Some of the Army controllers held over will be released by 30 September. Others will return to their military duty between then and the latest expected release date of 30 June 1983.

The airfield sites and number of controllers to stay include: Atlanta, 3; Buffalo, NY, 5; Dallas/Fort Worth, 2; Houston, 3; Memphis, TN, 1; Reno, NV, 3; Syracuse, NY, 2; Augusta, GA, 2; Alton, IL, 1; Burbank, CA, 1; Cleveland, 2; Kansas City, MO, 5; Pittsburgh, 3; St. Louis, 5; Washington (National Airport), 8; Midland, TX, 1; East St. Louis, IL, 3; and Indianapolis, 3.

As of 30 April there were 93 Army controllers at 29 FAA locations, with 160 already having been released to return to their duty stations.

(USACC PAO)

FROM WASHINGTON

Desert Aviation. An Army Aviation company is part of the United States' main military contingent to the Multinational Force and Observers which has been in the Sinai since March. It is Company C of the 82d Airborne Combat Aviation Battalion, and it is serving in the Sinai with the 1st Battalion (Airborne), 505th Infantry, 3d Brigade, 82d Airborne Division. There are over 800 members of the Ft. Bragg, NC, division who are part of the approximate 2,500-member MFO international organization set up as a result of the Egypt-Israel treaty of peace dated 26 March 1979.

(ARNEWS 234)

AVIATION PERSONNEL NOTES

Upcoming Board Dates

THERE ARE SOME very important upcoming board dates that will be of interest to the aviation community.

The LTC AUS Promotion Board will convene 2 June to 16 July to consider all majors with a date of rank of 9 February 1977 and earlier for above the zone consideration, 10 February 1977 through 3 September 1978 for promotion zone consideration and 4 September 1978 to 14 August 1979 for below the zone consideration.

The Warrant Officer RA Integration Board will convene 7 July to 16 July to consider all warrant officers who have applied or who have 14 years of active federal service and a minimum of 3 years of warrant officer service.

A Warrant Officer RA Promotion Board will convene 27 July to 6 August to consider eligible warrant officers for RA CW2, CW3 and CW4.

Officers should ensure that their Officer Record Briefs, DA Form 4037 and Official Military Personnel File are verified and correct. ORBs may be verified at the servicemember's local military personnel office. A copy of the OMPF may be requested by writing to: HQDA (DAPC-POR-RS), 200 Stovall Street, Alexandria, VA 22332. Provide full name, grade, SSN and military or civilian address. MILPERCEN will send the microfiche at no cost; turnaround time is about 3 weeks.

Maintaining Aviation Force Structure Documents

IN 1979, an Aviation Task Force Steering Committee provided implementing guidance and policy changes associated with the CSA Aviation Career Pattern Decision. The mechanism given to aviation personnel managers to implement this policy is through the validation of aviation requirements in the force structure documents. The current personnel management regulations for identifying aviation force structure requirements and authorizations are AR 570-1, "Commissioned Officer Aviation Position Criteria," AR 611-1, "Military Occupational Classification Structure Development and Implementation," and AR 611-101, "Commissioned Officer Specialty Classification System." These regulations provide policy, procedures and positions in TOE, MTOE and TDA units. These criteria were developed for application to authorization documents from Public Law 93-294 (Aviation Career Incentive Act of 1974) and AR 600-105.

The aviation commander should ensure that the authorization documents reflect the correct and desired data so that officers are identified and trained in the right numbers with the right skills to satisfy Army requirements. Incorrect data will affect accessions, requisitioning, training and assignments of aviators Armywide. Listed below are some basic guidelines that may help. If a position requires the skills of an aviator, the position should be reviewed for appropriate coding in accordance with the following criteria:

- Positions will be identified with SC and SSI 15A, 15B, 15C, 15M, 15S, 67J or 71A and appropriate additional skill identifiers. SCs 15 and 71 will not be combined with SC 11, 12, 13, 14 or with each other. See AR 611-101 for specific coding instructions.
- Requirements for aviators with military intelligence skills will be identified with SSI 15M.
- Requirements for aviators with signal skills will be identified with SSI 15S. Additionally, if the requirement is for air traffic control skills, the ASI of 3J will be used.
- Operational flying positions will be identified with an SSI of 15A, 15B, 15C, 15M, 15S, 67J or 71A as the primary position requirement followed by the primary aircraft designation ASI. Additional aircraft qualifications or language requirements will be reflected in the LIC position.
- Aviation positions which require aviation expertise but not the performance of flying duties will be identified with appropriate aviation SSI as the primary position requirement with an ASI of 1X.
- Nonoperational aviation positions coded 1X which require previous qualifications in a specific aircraft will have appropriate aircraft ASI indicated in LIC column of authorization documents.
- No lieutenant aviation positions will be coded 1X. Only limited captain positions may be coded 1X; however, if a requirement does exist for a nonoperational company grade position, it must reflect a captain requirement vice lieutenant.
- Duty titles should be career enhancing and provide professional development for the commissioned aviator.

These basic rules will help planners at all levels identify and train the right officer for the job desired. It is incumbent upon the aviation community to police our documents in order to reflect the most current and correct data.

ARMY AVIATION– AGE FORTY

by Colonel Emmett F. Knight

Conceived to fill a need not fully recognized, to form an overflying crest
Soldiers: organic, extended eyes and ears and voice flying above the best.
Weaving an overlapping seam along the edge of air and ground
Commanders carried aloft, ranging with the guns and flying to the sound.

Born forty years ago to a fractious Army family of ground and Air Corps
Weaned in North Africa, Italy and France to a diet of worldwide wars.
In Asia and in Germany, all together in Army combat shoes
Concerned with how best to fight the enemy; there were divergent views.

Army Aviation, formed with hidden strengths of ingenuity and drive
With pilots performing air liaison a new capability comes alive.
Light and fragile in the beginning, but with clear-eyed vision at the hub
Flying fabric covered "Grasshoppers," Stinson and Piper Cub.

In three years the war is over; the one to end them all of course
So the victorious nation reorients resources and begins to starve the force.
The Air Corps still flew, off into the blue, by high performance seduced
For the Army troops, an old idea comes true; the helicopter is introduced.

Soon, lo and behold, this nine year old is once again thrust over the fray
New concepts of vertical lift and troop insertion keep the enemy at bay.
Rotary wing for medevac, a Godsend proven on that rugged Korean ground
Metal airplanes replace flimsy fabrics; improved combat support is found.

Those lessons learned, this youth comes home with experience that shows
He fills a void the Air Force can't, his early promise grows.
Planning, expanded training, procurement and logistics
Helicopter R&D takes off, Rucker explodes, growth defies statistics.

Real surveillance, and cargo fixed wing craft above the best are found
An integral part of Army combat strength; aviation units the world around.
Improved helicopters are developed for increased support of the troops
In CONUS and Korea and Europe this lad is beginning to run in groups.

Growing fast, but those old cantankerous recips comprise the power of the fleet
With brains and sinew and bone structure in place, he's rapidly adding meat.
Then a major change – turbine power for muscle begins to appear at age fourteen
Opening new horizons of sky cavalry; airmobility is no longer just a dream.

At age twenty with aircraft turning obsolete, another war . . . "Play it again, Sam"
Our willing crews will be sorely tested in the jungle of Vietnam.
Soon Shawnees and Mojaves give way to Iroquois and Chinooks . . . then damn
The Caribous are lost to the Air Force in that old roles and missions scam.

Helicopters armed for combat soon help to dull the pain and by age twenty-five
A milestone passed, a final phase achieved, an airmobile division is alive.
A hardened veteran then, with choppers rampant on the Vietnam combat scene
Army Aviation becomes highly visible on the home front TV screen.

Still fighting at age thirty, youthful vigor and power now fully mature
A proud warrior standing tall and straight, his massive strength secure.
Mauled by the ever increasing intensity of that unpopular far-off war,
He faces about to quit the field with a chagrin never suffered before.

So home again, battle scarred, proud, and in need of rest and recuperation
Yet anxious to refit and rearm before the next crisis to face the nation.
But history repeats anew after all our wars, the struggles will be again
To compete for suddenly restricted resources amid the ennui that follows pain.

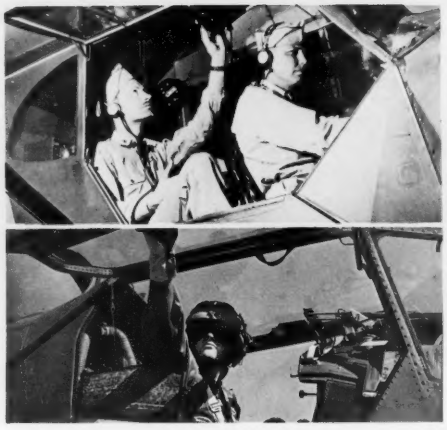
Army Aviation, combat proven today, but with the anxiety that middle age brings
Many aircraft are older than the flyers, and them drawing boards don't have wings.
The Russians have watched and listened; witnessed our success in airmobility
Their Hips and Hinds in quantity show their respect for helicopter capability.

Thirty-nine and holding? No, that's a thing one can't achieve – Time moves on
And now we face a scenario of radars and smart weapons in organic echelon.
The future unfolds as usual with predictable events but at an accelerating pace
And we in Army Aviation are part of a frenzied technology race.

"The light at the end of the tunnel," remember when that bromide first flew?
There is a new generation of flying machines and we've actually bought a few.
The Black Hawks are really superior and there will be a rejuvenated medium too
Apaches are at the junction, without the Scouts per se but with AHIP in lieu.

But then take a look at the numbers and compare the production rate
Think a minute about helicopter air-to-air and now let's calculate.
Army Aviation at age forty, resolutely marches toward its fate
Press on, old warrior, forward, let's ensure that we're not too late.

AVIATOR SELECTION RESEARCH THEN AND NOW



John A. Dohme, Ph.D.
William R. Brown, M.S.
Michael G. Sanders, Ph.D.
U.S. Army Research Institute Field Unit
Fort Rucker, AL

The armed services have traditionally used tests to screen flight school applicants for the purpose of reducing attrition in the flight training program. Selection testing in Army Aviation goes back to the days of the Army Air Forces. A problem was identified in the attrition of aviators during World War II. In order to graduate 100 Army aviators, it was necessary to accept 397 trainees (5). To reduce this unacceptable rate of attrition, a team of psychologists was established under the direction of Colonel J. C. Flanagan. That team implemented the first edition of the Army Air Forces Qualifying Examination (AAFQE) in 1942(9). The AAFQE was a pencil and paper test designed specifically for the quick selection of aviation trainees (10). At the same time, the Aircrew Classification Battery (ACB) was developed using seven processor-based portable testing devices which could be installed at performance-based tests. The ACB used apparatus adapted from psychological research to measure: complex coordination, rotary pursuit, finger dexterity, discrimination reaction time, rudder control (foot coordination), two-hand pursuit and two-hand coordination (13). The combined usage of AAFQE and ACB as selection tests reduced the number of individuals required to graduate 100 aviators from 397 to 155 (5). This corresponds to a reduction in the attrition rate from 75 percent to 35 percent.

Performance-based testing was discontinued after World War II, not because it was ineffective, but because it was time-consuming to administer and equipment of that era was unreliable and difficult to calibrate (1). Researchers of that era (10) and the present era (4) agree that performance-based tests would add significantly to the prediction of flight training performance. Historically, because of the cost of obtaining testing apparatus and setting up regional centers for performance based testing, the services are currently using only paper and pencil tests. However, the technology of microprocessors has largely solved the problems of reliability and calibration. The Army Research Institute (ARI) and the Air Force Human Resources Laboratory are currently experimenting with microprocessor-based portable testing devices which could be installed at Military Entrance Processing Stations (MEPS) regional test centers (formerly called Armed Forces Entrance and Examination Stations). If scores on these test devices prove to be reliable and valid indices of

the aptitudes and abilities required to succeed in Army flight training, then the Army could share the cost of operating and maintaining them with the Air Force. Coordination between Army and Air Force research laboratories is continuing in this area of emerging technology.

Postwar Flight Selection Testing

After World War II, the Army formed its own aviation organization primarily with personnel who remained with the Army after the formation of the Air Force. However, as these experienced aviators left the Army, the problem of high attrition in pilot training reoccurred (12). The problem was especially acute with enlisted personnel in training to become helicopter-qualified warrant officers. Initially, existing Air Force and Navy selection tests were examined but they were ineffective predictors of rotary wing training performance (12). Research began in 1955 which led to the fielding of the Flight Aptitude Selection Test (FAST) in 1966. The FAST consisted of two batteries: one for officer applicants and one for warrant officer candidate (WOC) applicants. Each battery provided both a rotary wing aptitude score and a fixed wing aptitude score, but a combination of the two, called the composite score, was used for selection. Both FAST batteries were validated against flight school performance and were found to be effective predictors of overall performance in flight training and also effective predictors of elimination due to "flying deficiency" (12). These batteries were used for aviator selection with only minor changes in scoring format until the spring of 1980 when the Revised FAST (RFAST) was implemented.

The Revised Flight Aptitude Selection Test (RFAST)

The RFAST was developed by ARI in 1978 to meet several objectives: (1) Reduce test administration time by shortening the test, (2) provide for machine scoring of the answer sheets to reduce errors which occur when the test is hand-scored in the field and (3) combine the two batteries to create a single test valid for the selection of officer and WOC trainees. Figure 1 compares the composition of the RFAST with the old FAST batteries. The number of test items has been reduced from more than 500 to 200 and the administration time reduced from 4 hours to 2 hours. To date, about 15,000 applicants have been tested using the RFAST but, because of the time required for applicant selection and Initial Entry Rotary Wing (IERW) training, only about 200 RFAST applicants have graduated from the IERW program. Overall, the mean score for all applicants is 99.4 and the standard deviation is 21.1.

Test	FAST Officer Battery	FAST Warrant Officer Battery	RFAST
Biographical Information	✓		✓
Mechanical Principles	✓		✓
Flight Orientation	✓		
Aviation Information	✓	✓	
Helicopter Information	✓	✓	✓
Mechanical Information	✓	✓	
Mechanical Functions	✓	✓	
Visualization of Maneuvers	✓	✓	
Instrument Comprehension	✓	✓	✓
Complex Movements	✓	✓	✓
Stick and Rudder Orientation	✓	✓	✓
Self-description		✓	

FIGURE 1: Composition of FAST and RFAST batteries

A pilot study was performed to estimate the validity of the RFAST (2). A sample of 178 WOC trainees who had been selected with the FAST WOC battery was given the RFAST shortly after entering IERW training. In this small sample, the RFAST was found to predict IERW overall grade moderately well, which serves to validate the test in a preselected sample. A large-scope validation study is currently underway pending the graduation/elimination of a large number of trainees.

Current Developments and Applications

Recently, ARI was tasked by the deputy commanding general, U.S. Army Aviation Center, Ft. Rucker, AL, to review attrition in the IERW program. This study traced all Army IERW flight students entering training in fiscal year (FY) 1980 and the first 20 classes of FY 1981 (later classes had not reached the point of graduation).* Students were followed, through turnbacks and other administrative procedures, until they had either graduated or were eliminated. Altogether, 1,108 officer and 2,185 WOC students were studied.

*Complete results of this study are presented in Dohme, J. A., Brown, W. R., and Sanders, M. G., Comparison of minority/majority attrition in the Army initial entry rotary wing aviator course: Predicting graduation elimination from FY 80 and 81 entry scores, Research Report, Army Research Institute, Fort Rucker, AL, 1982.

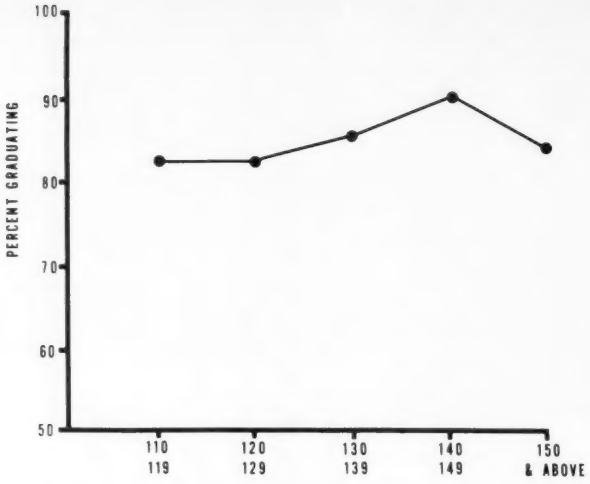


FIGURE 2: Percent of WOC students graduating as a function of GT score

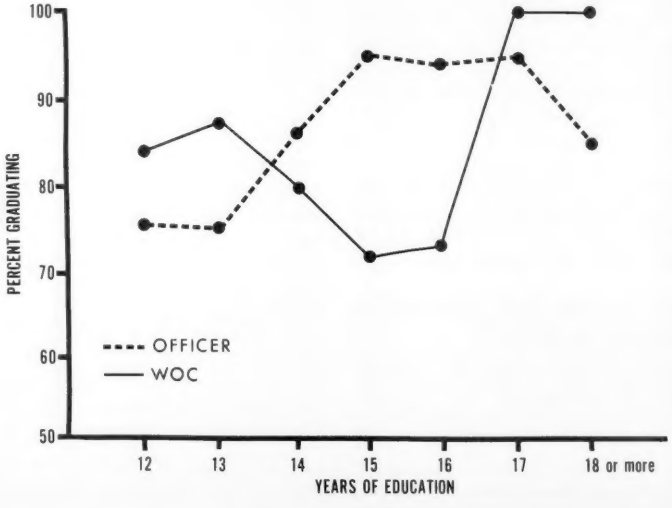
The research project examined a number of correlates of attrition: training phase in which attrition occurred, stated reason for elimination, and trends over time in elimination rates by comparing FY 1980 to FY 1981 data with FY 1974 to FY 1979 data (3).

As the correlates of attrition were identified, it became clear that the FAST and certain other variables were good predictors of IERW performance. In other words, this research effort set out to understand what causes IERW attrition and reaffirmed the value of selection testing. The ARI Research Report provides a complete review of the attrition study. Selected highlights of that study are presented below to describe the role of research in aviator selection procedures. The four predictors of attrition are: General Technical (GT), education, age and FAST.

GT. The GT score on the Armed Services Vocational Aptitude Battery (ASVAB) is used to screen applicants for the Aviation Warrant Officer Flight Training Program. The GT is one of several aptitude area composites which the Army employs in the classification of enlisted personnel. The current GT test contains three components: Arithmetic Reasoning, Word Knowledge and Paragraph Comprehension. A cut score of 110 (about the 65th percentile) on the GT is used to screen applicants for flight training. In other words, only 35 percent of all enlisted personnel score at, or above, 110 and thus become eligible to apply for the WOC Flight Training Program.

Figure 2 presents the relationship between GT scores and the percent of WOCs graduating from IERW. The vertical axis can also be interpreted as the probability of graduation for an individual with a given GT score. The data plotted show a slight positive relationship which is not statistically significant. Other research (11) revealed that the GT score is correlated with other measures of success in the IERW Program, especially academic grades. The data suggest that the GT is effective in screening out individuals that would not be successful in the IERW program. However, the severe restriction in range caused by the screening of all individuals below 110 prevents the direct evaluation of flight training performance of individuals with low GT scores.

FIGURE 3: Percent of students graduating as a function of years of education



Education. It was hypothesized that the trainee's number of years of education would predict performance in the IERW course. Figure 3 presents the relationship between education and the probability of graduation for officers and WOCs. While both curves show a slight positive overall relationship, education is not a good predictor because the functions are not linear. In other words, the two functions deviate greatly from straight lines and the interaction between the two functions, represented on the graph by the lines crossing at two points, suggests that the relationship between education and IERW performance is considerably different for officers and WOCs. However, drawing conclusions from the graph about the relationship between education and probability of graduation should be tempered by the fact that several of the data points represent very few people. For example, 7 WOCs have 17 years' of education and only 4 have 18 or more.

While education has been shown to positively correlate with IERW academic grades, it was a significant predictor in only one phase of the current attrition study. When the four predictor variables were used to forecast elimination for reasons of flight deficiency or failure to progress (that is, flight related eliminations only, not those for medical or administrative reasons), then education became a significant predictor for the WOCs. However, even in that phase, it was not as effective a predictor as age and FAST. Additional investigation of the relationship between education level and IERW performance is required to understand this complex area.

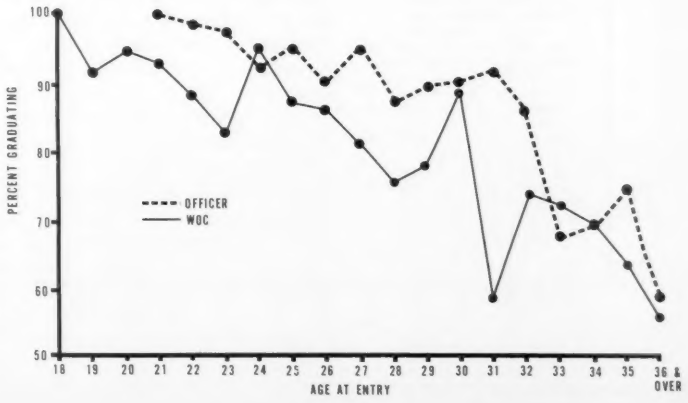
Age. This study is one of the first to consider age as a predictor of IERW training performance. Prior to the 1980 to 1981 timeframe, the number of older trainees in the IERW Program was small. Until August 1976, the age limit for trainees was established at 28. About 15 percent of the trainees in the FY 1974 to FY 1979 attrition study (3) were older than 28. In the current study, about 26 percent of the FY 1980 and FY 1981 trainees were older than 28. Thus, until recently, it hasn't been possible to look at a large enough number of older trainees to adequately evaluate their performance in IERW training. Therefore, the trends presented in figure 4 represent new information for use in selecting the best qualified applicants.

The study found that overall, eliminees (officers and WOCs) were considerably older than graduates. The graph presents the probability of graduation as a function of age. While there are some perturbations in the curves, the overall relationship is *significantly* negative. Each curve shows a point of inflection, at about age 30 for WOCs and 31 for officers, above which the probability of graduation drops sharply. The reasons for this age effect are unknown; more research is needed to identify the causes and correlations of age related attrition.

Warrant Officer Candidate FAST Scores. The study revealed that there was a sizeable decline in the average FAST score over time for WOC graduates and eliminees. In the FY 1974 to 1979 time period, the average FAST score for graduates was 341.4, while in FY 1981, it dropped to 328.4 The decline in FAST scores was a result of a DA policy decision to lower the FAST cut score for WOCs from 300 to 270 for about 9 months in FY 1980 to 1981 to meet surge training requirements.

A primary finding of the study was the strong positive relationship observed between the FAST and probability of success in IERW (reference figure 5). When the FAST cut score was 270, more than 200 WOCs were admitted to the flight training program with scores between 270 and 299. As figure 5 indicates, their rate of success in the program was considerably lower than that of higher FAST scorers. About 37 percent of the 270 to 299 group were eliminated in IERW as compared with the 14 percent of the 300 and above group. The point of inflection at about 300 suggests that the FAST is a particularly effective screening test and a moderately good overall predictor. In other words, the test is better at identifying individuals who are poor risks in flight training than it is at identifying potential outstanding students. This

FIGURE 4: Percent of students graduating as a function of age



finding reinforces the use of the FAST as a screening test.

FIGURE 5: Percent of WOC students graduating as a function of FAST scores

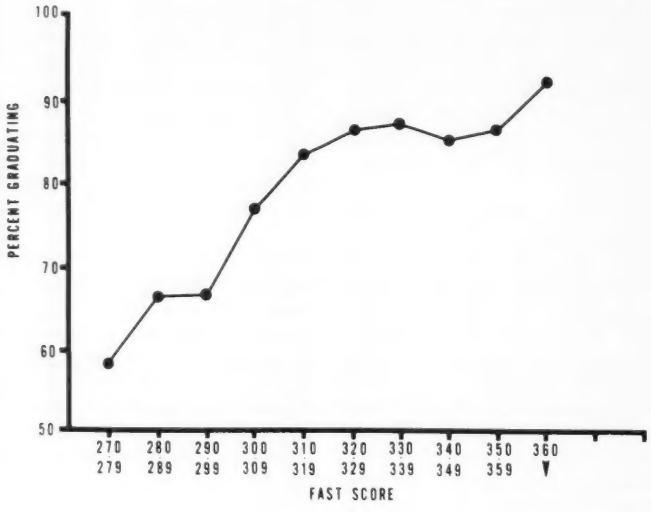
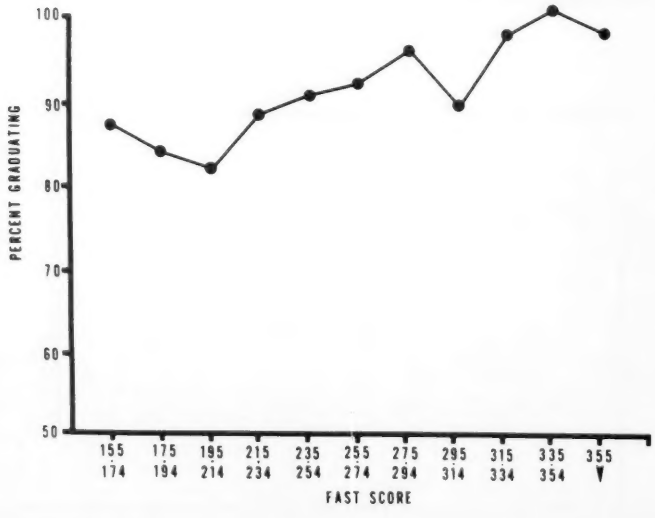


FIGURE 6: Percent of officer students graduating as a function of FAST scores



Commissioned Officer FAST Scores. As can be seen in figure 6, the FAST is also a significant predictor of IERW performance for commissioned officers. However, it is not nearly as effective a screen as is the WOC battery. Officers are prescreened by the attainment of a baccalaureate degree and/or the military development training received in Officer Candidate School (OCS), Reserve Officer Training Corp (ROTC) and the Military Academy. Thus, it is not surprising that officers with low FAST scores are more successful in IERW training than low scoring WOCs. MILPERCEN policy has reflected this difference in the past by setting the WOC cut score at 300 (corresponding to the 50th percentile) while the commissioned officer cut score was 155 (corresponding to the 8th percentile). In other words, the WOC cut score excluded the lowest 50 percent of the applicants from selection whereas the commissioned officer cut score excluded only the lowest 8 percent.

At the present time, nearly all students entering IERW training have taken the RFAST which consists of only one test form with the same cut score for commissioned officer and WOC applicants. Current MILPERCEN policy sets the cut score at 90 out of 200 possible points. WOCs who score between 90 (34th percentile) and 99 (the median or 50th percentile) on the RFAST are expected to have about the same success rate as WOCs scoring between 270 and 300 on the FAST.

Prediction of IERW Graduation/ Elimination

The selection/screening variables discussed above (GT, education, age and FAST) were statistically combined to evaluate their intercorrelations and combined predictive capability. The statistical technique

discriminant analysis was used to combine all four variables. The results showed that the discriminant analysis correctly predicted IERW graduation/elimination for 72 percent of the WOCs and 79 percent of the commissioned officers. When discriminant analysis was used to predict elimination due to flight deficiency (not considering medical or administrative eliminations) versus graduation, the correct prediction improves to about 82 percent for WOCs and 86 percent for commissioned officers. In these discriminant analyses, nearly all the predictive power was in the two variables, FAST and age. The contribution of the other two variables (GT and education) was minimal.

Practically speaking, MILPERCEN and U.S. Army Recruiting Command (USAREC) personnel could use an individual's age and FAST score to predict graduation/elimination and be correct about three times out of four by using this discriminant analysis technique.

Enlisted vs. Civilian Entry

About 24 percent of the WOCs entering IERW in FY 1982 are classified as civilian entry (CE). In other words, they enter the Army specifically for the purpose of attending the flight training program. The remaining 76 percent are selected from Army enlisted applicants (EA). Some CE students have had prior enlisted service in the Army or in the other services. The 76 percent to 24 percent ratio of enlisted to civilian entry WOCs selected has not been constant over the years. In FY 1976, the ratio was 30 percent EA to 70 percent CE and in FY 1979 it was 85 percent EA to 15 percent CE.

An evaluation of IERW applicant data indicated that the mean RFAST score is higher for CE than for enlisted entry *applicants* (105 vs. 96 respectively). While fewer individuals enter as civilians, they have a higher expected success rate because of their higher FAST scores. Additionally, because of the large civilian applicant pool, USAREC can selectively choose only high scoring applicants. Changing the ratio to a more balanced percentage would increase the mean FAST score of entering students but it would also impact the "end strength" of the Army, i.e., the number of acquisitions USAREC is permitted without exceeding limitations of overall Army personnel strength.

Summary

In summary, while no selection technique will ever correctly identify all eliminees, the use of selection tests and related measures has continued to reduce attrition in Army Aviation training. The Aviation Center is working with MILPERCEN and USAREC to minimize attrition by selecting those applicants who have the highest probability of success. Currently, plans are being formulated to determine optimal test score weighting techniques for use by MILPERCEN and USAREC selection boards. The weights given to test scores by selection boards should be revised periodically to assure that selection techniques are responsive to changes in the applicant pool and changes in the IERW Program.

Research to Improve Aviator Selection and Assignment

In cooperation with the Aviation Center, ARI is continuing to develop and evaluate aviator selection and flight school attrition in order to improve the efficiency of the process and reduce training costs. ARI projects currently underway address:

- The development of a new FAST which will select individuals who can meet WOC Military Development Course requirements as well as evaluate individuals on cognitive and perceptual abilities required in new and existing aircraft.
- Ensuring fairness in the selection of all applicant groups.
- The development of a battery of tests to be used for IERW track assignment (aeroscout, attack, utility and later cargo).

REFERENCES

1. Adams, J. A. An evaluation of test items measuring motor abilities. USAF Personnel and Training Research Center, *Research Report* No. AFPTRC-TN-56-55, Lackland AFB, Texas, 1956.
2. Brown, W. R., Dohme, J. A., and Sanders, M. G. Changes in the U.S. Army selection and training program. Presented at the 1981 Symposium on Aviation Psychology, Ohio State University, Columbus, Ohio, April 1981.
3. Brown, W. R., Dohme, J. A., and Wick, D. C. An evaluation of minority and female performance in Army rotary wing aviation training. ARI Research Report submitted for publication, July 1981.
4. Cronbach, L. J. *Essentials of Psychological Testing*, 3rd Edition, Harper and Row, Inc., New York, 1970, p. 97.
5. Davis, F. B. (Editor) The AAF Qualifying Examination, Army Air Forces—Report #6, Washington, D.C., 1947 (AD 651 782).
6. Dohme, J. A. An evaluation of the fairness of the flight aptitude selection test (FAST). *Proceedings, 23rd Annual Conference of the Military Testing Association*, 1981, pp. 345-354.
7. Dohme, J. A. and Sanders, M. G. Validation of the aeroscout selection process. Research Report, Army Research Institute Field Unit, Fort Rucker, Alabama, 1979.
8. Eastman, R. F. and McMullen, R. L. Item analysis and revision of the flight aptitude selection tests. Research Memorandum, Army Research Institute Field Unit, Fort Rucker, Alabama, 1978.
9. Flanagan, J. C. (Ed.) The Aviation Psychology Program in the Army Air Forces, Army Air Forces, Aviation Psychology Program, Research Report 1, Government Printing Office, Washington, D.C., 1948.
10. Guilford, J. P., and Lacey, J. E. (Ed.) *Printer Classification Tests, Parts I and II*. Army Air Forces, Aviation Psychology Program, Research Report 5, Government Printing Office, Washington, D.C., 1947.
11. Hertli, P., Brown, W. R., Sanders, M. G. and Dohme, J. A. The prediction of success in Army Aviation training: A study of the warrant officer candidate selection process. Working Paper 82-1, Army Research Institute Field Unit, Fort Rucker, Alabama, 1981.
12. Kaplan, H. Prediction of success in Army Aviation training. Technical Research Report 1142, US Army Personnel Research Office, OCRD, 1965.
13. Melton, A. W. (Ed.) *Apparatus Tests*. Army Air Forces, Aviation Psychology Program, Research Report 4, Government Printing Office, Washington, D.C., 1947.
14. North, R. A. and Griffin, G. R. Aviator selection 1919-1977. Special Report 77-2, Naval Aerospace Medical Research Laboratory, Pensacola, Florida, 1977.
15. Oosterhof, A. C., Atash, M. N., and Lassiter, K. L. Evaluation of the Revised Flight Aptitude Selection Test for possible bias and development of experimental unbiased items. First Interim Progress Report to Contract MDA903-81-C-0085, Fort Rucker, Alabama, 1981.

Employment Of Army Aviation: Filling The Void

THE U.S. ARMY Aviation Center's Training and Assistance Team (ACTAAT) has recently reported two issues that continue to plague the improvement of Army ground and air combined combat effectiveness. The issues are well known to all members of the combined arms team, yet there is no indication that a resolution is near at hand.

The first of these issues is the noticeable void of training for ground commanders, and their staff, in the tactical employment of Army Aviation assets. This issue was addressed by the Chief of Staff of the Army on 9 November 1981 at the Aviation Center. The Chief of Staff addressed a requirement to educate and sensitize commanders in the tactical employment of Army Aviation at all levels. This could be accomplished, he indicated, by instruction being added to the command courses and through increased command influence in the conduct of unit training and training exercises. The Aviation Center is making some progress in the education of ground commanders by providing a series of aviation related instructional materials that are designed to be taught in the combat arms branch schools. Although the problem is being addressed at the service school level, it will take time to raise the comprehension of combat arms officers through the institutional system alone.

The second recurring issue is in much the same status as the first. This issue is: Newly assigned commissioned aviators need more training in the tactical employment of Army Aviation. Steps to improve our commissioned aviators' ability to lead and correctly employ their assets through training at the Aviation Center must await the resource approval of new training programs.

The only "quick-fix" to either of these issues is on-the-job training in the field environment. The best person to teach the ground commander and his staff how to use his fellow aviation combat team member is the aviation team commander himself. We must be good salesmen for our product, and we must go out and sell it to the ground commander. While making our sales pitch we take the time to brief the ground commander on what our unit can and cannot do to support our end of the combined arms team. To do this, we must first be knowledgeable of the ground commander's mission, area of operation and support requirements. We must now plan how our unit mission and capabilities fit with that of the ground commander and how we can best provide mutual support for each other.

Once we have done our planning and we know that we have the right answers to all the ground commanders' questions, then what? Now comes the time to advertise our product. Perhaps the best way to do this is to prepare a slide briefing that will best show our unit capabilities and limitations. Yes, we include our limitations because this is the area that is often misunderstood by the ground commander. The ground commander must understand fully why we can't always support him as he has requested, why we will sometimes be late, why we cannot always stay onstation as long as he would like and why sometimes we may not show up at all. We make our briefing short, to the point, but we cover the areas that are critical to mutual understanding of our mission and support requirements. Now we get ourselves invited to the ground commander's staff meeting or officers' training class, show our slides and sell our unit's product. Whenever possible, we should loan out one of our experienced aviators to work as liaison between the ground commander and our unit. This liaison officer can do much to sell our product, especially during field training exercises. Both these methods worked well in Europe in the mid-1970s to sell the TOW Cobra to the ground commanders, and it still works well today. One thing to remember—as unit commanders and their staff are reassigned, it is a must for us to go back and bring the new people up to date with our briefing.

Now for the newly assigned aviator just out of Ft. Rucker. We get these new people involved with the planning for our pitch to the ground commanders by leading them through the briefing and telling them how and why it was developed. Then, we take them to the briefings for the ground commanders so they can

get a feel for the viewpoints of other combat arms members. This is a quick way for the new guy to get his feet on the ground, get involved with the unit mission and see how his unit fits into the combat arms team. This will not make him an instant success at employing his unit assets, but it will speed up his learning process and give him a sense of direction for learning future employment tasks.

The burden of educating the aviator and ground commander in tactical employment of aviation assets will remain, for the near future, that of the aviation units in the field. The methods described above are only a few of the many ways that we in Army Aviation can affect and improve the coordination and use of aviation within the combined arms team. If your unit has conducted unique coordination or education efforts with ground units let us know about them. These ideas will be used to expand upon this same topic in a future issue. As always your ideas, suggestions and comments are welcomed. Please submit your ideas for consideration to the Director of Evaluation and Standardization, ATTN: ATZQ-ES-E, Ft. Rucker, AL 36362.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362; or call us at AUTOVON 558-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hot Line, AUTOVON 558-6487 or 205-255-6487 and leave a message

CONNECTION

ACTAAT

Aviation Center Training Analysis and Assistance Team

IMC FOR COBRA

ISSUE: Tactical instrument guidance requires aircraft not certified for instrument meteorological conditions (IMC) flight to be flown in IMC. Aviators express concern about being expected to fly in the more hazardous tactical instrument environment in aircraft not authorized to fly under standard instruments conditions. Are there any ongoing efforts designed to eliminate this problem?

COMMENT: There have been attempts to certify the fully modernized Cobra. At this time, there are four basic issues which came out of a recent test. These issues are being researched by U.S. Army Aviation Research and Development Command. The user community acknowledges a need for attack helicopters to be capable of flying IMC in those areas where the air defense threat is not present, e.g., port of debarkation to corps or division rear. A requirement to fly the attack helicopter IMC in the main battle area (MBA) does not exist because current doctrine stresses nap-of-the-earth flight techniques for all helicopters forward of the rear boundary. The major issue which surfaced from the above mentioned test is the variance of airspeed during ascents and descents. Errors of up to 18 knots have been recorded. Costs, in terms of time, dollars and testing to correct the alleged deficient areas is considered excessive by the user. The user consensus is that IMC flight is desirable in the AH-1S, however, it is also contended that the AH-1S presently provides emergency IMC recovery capability without application of extensive fixes. The U.S. Army Materiel Development and Readiness Command has been tasked to evaluate its certification criteria. Certification to fly in instrument conditions and capability to fly in instrument conditions are two different requirements. The scout helicopter has the capability to fly in tactical instrument conditions when required in special situations. Normally, the scout helicopter will be flown only in VFR conditions. (Directorate of Combat Developments)

SOVIET AIR DEFENSES
Against Attack Helicopters

In this three-part series, the author reviews current Soviet military literature in an effort to determine vulnerabilities in their air defense against low level attack helicopters. He examines air defense philosophy, Soviet small arms, the SA-7 and the ZSU-23-4 at the Soviet battalion level. Although there are several vulnerabilities which can be exploited, the author concludes that the primary threat to helicopters is the Soviet ZSU-23-4. Changes to current U.S. antitank helicopter training and tactics are recommended in order to enhance the helicopter vs. tank kill ratio

PART 2: Individual Weapons

Lieutenant Colonel Brian P. Mullady
59th Air Traffic Control Battalion
APO New York

TOO LITTLE HAS been written concerning the importance of individual weapons and small arms against attack helicopters. In the numerous articles discussing the more sophisticated Soviet air defense weapons, it is easy to lose sight of the fact that a lone AK-47 gunner, within the proper range, can have the same effect on an attack helicopter as the most sophisticated defenses: He can destroy it.

The small arms weapons of the tank and motorized rifle battalions are indeed a serious threat, if only because they are so numerous. For example, a motorized rifle battalion will have about 201 AKMs (assault rifles) available and the 31 BMP/BTRs (armored personnel carriers) of the battalion will add 31 additional 7.62 mm machineguns and, in the case of BTRs, 31 additional 12.7 mm or 14.5 mm antiaircraft machineguns. Each of the 31 tanks in a tank battalion mounts a 7.62 mm machinegun, and tanks are often seen with a 12.7 mm or 14.5 mm antiaircraft gun.

Soviet troops are trained to use their individual and vehicle-mounted weapons in an air defense role. The philosophy of small arms weapons against air targets is that these weapons will be massed against individual targets. One Soviet author stresses the psychological factor of massing fires when he writes, "Under conditions of intense fire opposition, pilots are forced to maneuver, climb and shorten aiming times. All this lowers the effectiveness of onboard systems." The Soviet training and exercise literature make it quite clear that, in a stationary or defensive role, the optically-sighted small arms weapons will probably form the bulk of the threat against air assault operations. And, it is stressed, "firing as a unit is the most effective means of engaging aerial targets."

However, in looking for vulnerabilities, the most obvious is that the individual weapons are generally unusable when the unit is moving. The AKMs will be with the soldiers in the tanks or APCs. They will not normally be available during the attack either, if we are to accept the Soviet concept that dismounted attacks will be the exception on the modern battlefield. Also, when the unit is moving, the accuracy of the vehicle-mounted weapons drops correspondingly.

These weapons are all optically sighted. The gunner must first visually acquire the target, then relay the information to his commander who must acquire the target, relay the location to the firing unit, and give the fire command for massed fire. All this takes time. And in low-light conditions, bad weather or brief unmaskings by the helicopter, the pilot has the advantage.

Additionally, the attack helicopter has a great range advantage; and this is the best defense against small arms fire. The AKM is credited with a maximum effective range of between 300 to 400 meters. The 7.62 mm machinegun is effective to 800 meters and the 12.7 mm and 14.5 mm can reach about 1,000 meters. An attack helicopter pilot, having discovered a unit without ZSUs attached, or after the ZSUs have been destroyed, might press the attack to within 1 kilometer—but should go no closer.

Attack helicopter pilots should know that all of these weapons are designed for both air defense and ground roles. The 12.7 mm and 14.7 mm guns especially have a direct fire role in actual combat. In other words, a Soviet unit in the offense would have far fewer of these weapons available for air defense. In fact, several Soviet authors stress the point that fire of rifle weapons must not be at aerial targets if it detracts from the main mission of the destruction of the enemy's ground forces.

There are also indications in the Soviet military press that they do not completely understand our attack helicopter tactics. They may be expecting attack helicopters to be much higher and moving more rapidly than will be the actual case. One article describes infantrymen firing at enemy helicopters "while lying on their backs." Another article written in 1979 boldly states that "scout helicopters are expected to be at altitudes up to 800 meters." The clearest picture of their small arms techniques against helicopters appeared in *Starshina Serzhant* in an article entitled "Low Altitude Target." The author writes that targets normally will be engaged at ranges of 700 to 900 meters. There are two types of fire: "defensive fire" and "accompanying fire." Defensive fire is used against air targets moving at speeds greater than 270 knots (nautical miles/hour) and consists of placing concentrated fire in front along the course of the target's flight path "in order to ensure the meeting of the target with the bullets' cone of fire." Accompanying fire is conducted by following the target's movement during firing. This type of fire will be used against attack helicopters. He then explains how to lead the helicopter: "It is useful to remember that during firing at the range of 100, 300 and 500 meters, the helicopter is led by 1, 3 and 6 body lengths respectively." This would seem to indicate that Soviet gunners are taught to lead slow-moving attack helicopters by too great a figure. Helicopter pilots should be aware that when receiving massed fire while moving at the nap-of-the-earth (NOE) airspeeds (less than 50 knots), most rounds will be passing in front of the aircraft.

The author mentions that tracer rounds should be at least a ratio of 1:4 and that "firing will only be at the order of the commander." Unit-delivered small arms fire is even more directly controlled than that of dedi-

T-54 medium tank with 12.7 mm antiaircraft machinegun

cated air defense weapons in order to provide effective massed fires and to avoid shooting at friendly aircraft. A typical firing command is quite lengthy: "From the front—three helicopters. Squad, at the helicopter above the grove, lead one aircraft length. Fire!" Obviously the more helicopters visible to the unit, the more complicated becomes the command. This all takes time.

Although small arms antiaircraft fire represents a serious threat to the attack helicopter pilot, it can generally be avoided by knowing the exact location of the enemy unit, using maximum firing ranges and minimum exposure times. Particularly dangerous would be an air attack against a Soviet unit in a defensive role. The Soviet's emphasis on camouflage and assignment of horizontal and vertical fields of fire could trap a low-flying aircraft within small arms range. The effectiveness of small arms against helicopters during Soviet movement or attack is severely degraded. In fact, the first actual test of attack helicopters against tanks proved this dramatically. During Lamson 719, the cross-border operation into Laos, conducted from 8 February to 9 April 1971, U.S. attack helicopters were employed against a North Vietnamese tank assault on Fire Base 31. The commander of the attack helicopters in the mission wrote the following account:

> The majority of the enemy tanks seen were T-34s mounting either an 85 mm or 100 mm main gun, a 12.7 and 7.62 mm turret machinegun. The remainder were PT 76s mounting what was believed to be a 76 mm main gun and a 12.7 mm AA gun and a 7.62 mm turret machinegun.
>
> We reported a total of 47 tank engagements. In all cases the tank used its 12.7 mm gun in defense. In some cases the tank used its 76 mm or 85 mm gun in defense. Most tanks were protected by troops and other weapons. *We did not lose an aircraft or crewmember from a helicopter-tank encounter* (emphasis added) . . . we reported . . . 6 tanks destroyed, 19 immobilized and 8 damaged by helicopters.

In short, Soviet ground fire can be avoided by precisely locating enemy units and maintaining greater than a 1-kilometer range. The air defense role of Soviet small arms would, of course, increase as other means are destroyed.

As is the case with Soviet small arms fire, the United States has had experience flying against the SA-7. It is a shoulder-fired air defense missile system which has been produced by the Soviet Union specifically for employment against low, slow-flying aircraft. It uses a passive infrared homing system, and its characteristics are reported as being quite similar to the U.S.-produced "Redeye." And, as the Redeye, it is used for company level air defense. First observed during the Arab-Israeli war of 1967, it is reportedly produced in two versions. The SA-7A missile reaches a speed of approximately 1,000 mph and has an effective range and altitude of about 2 miles. The SA-7B travels at approximately 1,300 mph with a maximum effective range and altitude of about 3 miles. If it misses the target, the missile is reported to self-destruct 15 seconds after launch (about 4 miles downrange). Each SA-7 team is composed of a gunner and assistant gunner, each carrying one missile.

The SA-7 is the only organic, dedicated air defense weapon available to motorized rifle and airborne battalions. It is not issued to tank battalions. Normally, it is regarded as the SAM system which complements the ZSU-23-4 gun system usually found at these levels of organization. Each company is assigned a section of three SA-7 gunners, making a total of nine SA-7 gunners in each battalion. Since each BMP has a storage rack capable of transporting one SA-7 missile, there is a potential for a battalion to carry a basic load of up to 30 SA-7 missiles. In airborne units the SA-7 would be complemented by the six regimental level ZU-23-2s. This weapon, unlike the ZSU-23-4, has no radar control, is not self-propelled and offers only half the fire power of the four-barreled ZSU-23-4.

A review of Soviet literature concerning the SA-7 indicates the Soviets have faith in its ability to bring down low-flying helicopters. No doubt their optimism stems from its reported effectiveness when first employed in 1972 in the Vietnam conflict. One Western source reports that one helicopter was downed for every three SA-7s fired in Vietnam.

Soviet military literature indicates how the Soviets plan to employ this weapon in modern war. In the assembly area, SA-7 gunners will be assigned sectors of responsibility but will stay with their companies. They will be primarily oriented on the most probable low-altitude approaches into the area. They are usually deployed on line facing the most dangerous avenue of approach or in a triangle with the apex facing the most probable direction of attack.

During the approach march and during the attack, the SA-7 gunners will proceed with their companies and one, as a rule, will be located in the same vehicle as the company commander. The attack helicopter pilot should note that the BMP/BTR will usually make a short halt to allow the SA-7 gunner to fire while standing in the rear hatch. It will probably be the only APC which suddenly halts during an air attack.

SA-7 Grail

In the defense, SA-7 deployment is similar to that in the assembly area. Sectors are assigned and primary target lines established for each probable low-level approach. The gunners will normally be positioned in a triangle formation within their company strong points and oriented on an assigned primary target line. The SA-7 gunners may also be positioned to fill in the gaps in radar coverage by the ZSU-23-4s. Finally, SA-7 gunners may be used, in strength of a section (three gunners) or more, to establish an antiaircraft ambush. This should be expected when there is only one low-level approach into the defensive area. Throughout discussions of air defenses in the defense, it is continuously stressed that at a minimum, primary, alternate and reserve firing positions will be used by SA-7 gunners. After firing, the SA-7 gunner immediately relocates to a different preselected position. Concerning the actual positioning of these weapons, one recent Soviet article described a rear area raid by airmobile forces establishing SA-7 ambush positions on the hilltops surrounding the objective, and another 1979 article, describing a defensive position in heavily wooded terrain, stated that SA-7 positions should be established on platforms located in the trees themselves.

The Soviet tactic is to launch several of these missiles at one target. U.S. pilots in Vietnam reported that helicopters were often fired on by multiple SA-7 rockets, occasionally as many as five at one time. The United States does not hold the same high opinion of the effectiveness of the SA-7 as do the Soviets. One report says the SA-7's low speed and altitude, short range and limited maneuverability reduce its effectiveness. This, coupled with the requirement for the operator to do the ranging for the system and a delay from firing initiation to missile launch, results in many missed targets.

According to another report, the SA-7 can acquire and attack only helicopters presenting an aft view, since the acquisition and attack angle is limited to a maximum of about 50 degrees off the tail of the target aircraft. Also, the missile can engage only aircraft flying above a minimum intercept altitude of 50 to 100 feet.

It also appears from Western sources that the new AH-64 advanced attack helicopter may be invulnerable to the SA-7 threat. One article states that U.S. Army tests have shown that the AH-64, as a whole, is below the lock-on threshold of any present or postulated infrared threat through the mid-1980s. Another states that the AH-64 "black hole" passively cooled infrared suppressive exhaust ducts "would appear to eliminate the SA-7 as a threat."

As stated above, reaction time is the most important factor in considering the effectiveness of Soviet air defense weapons against low-flying helicopters. It has been stressed as a vulnerability of the Soviet air defense philosophy and in their delivery of small arms fire. In this light, it is clear that the SA-7 has a severe disadvantage for use against suddenly appearing, rapidly fleeting air targets. How much time the SA-7 gunner actually needs to acquire and attack a target depends upon the curcumstances; but he must aim the weapon at the aircraft until he is locked-on, warm up his gyro, initiate fire and wait for missile launch. All this would have to be preceded by visual acquisition, identification and the command to fire. Additionally, nearly all recent pictures of SA-7 gunners preparing to launch show them wearing large goggles. Do they put these on after detecting the target, thus losing more valuable seconds, or do they scan the sector with them on, thus reducing the field of vision, especially in rain and fog? It would appear that attack helicopters can prevent an SA-7 "lock-on" by staying as close to the ground as possible, staying near heavily wooded areas and presenting only a head-on target for the SA-7 gunner.

Finally, although ammunition for the ZSU is specifically mentioned as being carried by vehicles organic to the regimental antiaircraft battery, there is no mention of how SA-7 resupply is accomplished. Since the SA-7 is a company air defense asset, logically the additional rounds would be carried in the company's BMPs, meaning the company would be forced to halt to transfer missiles from the BMPs to the gunners. In other words, in active combat and on the march, the SA-7 gunners would be unable to reload. There may also be a drop in SA-7 activity as front line units expend their missiles with no resupply.

In summary, a review of Soviet and U.S. sources indicates that the SA-7 is slow to employ and generally ineffective against attack helicopters, yet the Soviets appear to be counting on it.

In the August issue—Part 3: The ZSU-23-4 Shilka

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Compass Problems?

Conflicting reports are being received from the field regarding the quality and durability of the MC-1 compass, national stock number (NSN) 6605-00-515-5637, a component of the SRU-21/P survival vest, hot climate, cold climate and overwater survival kits. If you are having any problems whatsoever with the compass, please submit a quality deficiency report to the Commander, TSARCOM, ATTN: DRSTS-MCAPL, 4300 Goodfellow Blvd., St. Louis, MO 63120 and furnish an information copy of your QDR to the DRCPO-ALSE, ATTN: Mr. Ed Daughety, same address. We will review and expedite actions to resolve the problems being encountered.

New ALSE Training Films

The following aviation training films are now available from your local Audiovisual Support Center:

- TF 46-6203, "Inspecting the Overwater Survival Kit"
- TF 46-6204, "Inspecting the Cold Climate Survival Kit"
- TF 46-6205, "Inspecting the Survival Vest"
- TF 46-6206, "Inspecting the Hot Climate Survival Kit"

NOTE: More training films on ALSE are being developed and we will announce them as they become available.

Water Purification Tablet, Iodine, 8 MG, 50S

The Food and Drug Administration has issued disposition instructions on these tablets. Test results revealed that the following materiel is unsuitable for issue and use: Note: Credit/replacement not applicable. Activities will destroy this medical materiel in accordance with Para 3-48, AR 40-61, UP Para 2-10, AR 735-11:

Manufacturer Lot No.	Project No.
0416-600	D8102145SL
0416-604	D810150SL
2007-650	D810352SL
2007-652	D800468SL
2007-662	D810154SL
2007-673	D810543SL

Pam McLemore photo by Tom Greene

Operational Hazard Report (OHR)

The OHR is a viable tool in the hands of the aviation community and has been around for some 14 years. The OHR has brought about many changes in aviation operations, maintenance and systems during its lifetime and the trend toward aviation life support equipment (ALSE) is on the upswing, increasing the margin of safety for aircrew personnel.

The OHR is designed so that an individual in a unit can report a safety problem to the aviation safety officer and commander and, more recently, the ALSE officer. It also provides a means for the commander to tell the individual what was done about the reported problem. Currently, the Army Aviation community uses more than 13,000 OHRs per year. This is good because it means the OHR is doing its mishap prevention job.

The OHR can do a better job only if individuals will take the time to fill out the form and pass it along to

the aviation safety officer, ALSE officer or the operations officer. If there is a signature and address on the form, the commander must return a copy to the originator when corrective actions have been taken. If the originator does not choose to put his name and address on the form, that's all right too. The anonymous feature was established so the originator could avoid any problems that might arise from the report. Paragraph 5-5 of AR 95-5 will provide you with general information on the OHR. Use it to the benefit of the user and command for your increased safety and protection.

Correction

Reference is made to the PEARL article, "That Other First Aid Kit," in the March 1982 issue of the *Aviation Digest.* The information is correct but PEARL erred in the last sentence. POC for further information is COL L. Hugh Olander, Defense Medical Materiel Board, Ft. Detrick, Frederick, MD 21701. We apologize to COL Olander for this misprint.

ALSE Training Tidbits

Four ALSE training courses have been conducted at Ft. Eustis, VA. The fifth course is currently in session. The Fifth Army has concluded another ALSE training school; altogether, these schools and the Army National Guard ALSE schools being conducted at Little Rock, AR, make up some 400-plus personnel trained in ALSE. We also have continued support from the 25th Infantry Division, Eighth Army and Europe. We discussed the possibility of starting a supervisory type ALSE course at Ft. Eustis, VA. As we view it, we are probably talking about 2 weeks of intensive ALSE training for supervisors. We already cover an 8-hour segment in the aviation maintenance course at Ft. Eustis, VA, and a 4-hour segment at Ft. Rucker, AL, for all aircrew personnel.

Helmet, Flyers SPH-4

A loose grommet condition of the SPH-4 helmet was reported on a QDR from an Army activity. The loose grommet is on the earcup retainer assembly where the chin strap is attached by a screw and post. If the grommet pulls out of the material the chin strap will fail to function and the helmet may separate from the user. Recent design changes to the SPH-4 helmet will provide greater security in this area. Until the newly designed chin strap becomes standard issue, a one-time inspection of all earcup retaining assemblies now in use is recommended, and particularly items procured from Kings Point Manufacturing Company on Contract Number DLA100-80-C-2420. There is one grommet on each assembly. It should be inspected for security by grasping the grommet between the thumb and index finger and pulling downward. If the grommet can be rotated in the cloth, or shows signs of separating, a 3/4-inch flat washer should be added to the underside of the retainer assembly to ensure the screw and post do not pull away from the retainer assembly if the grommet becomes loose. This inspection and fix are offered in the interest of safety because of the critical function of the SPH-4 helmet to protect life and limb.

SPH-4 Helmet, Repair Of Components

When repairing certain components of the SPH-4 flyer's helmet, it is imperative to use the proper adhesive. Failure to do so will result in damage to the helmet as well as cause a potential safety hazard. Repair of the following components should be accomplished only with the proper corresponding adhesive. This information will be included in TM 10-8415-206-13 at a later date.

Components	Adhesive Used In Repair
Helmet Liner	Synthetic Adhesive, NSN 8040-00-833-9563
Rubber Beading	Synthetic Rubber Adhesive, NSN 8040-00-832-6173
Earcup Cushion Inserts	Adhesive, NSN 8040-01-021-4173 and NSN 8040-01-021-4172

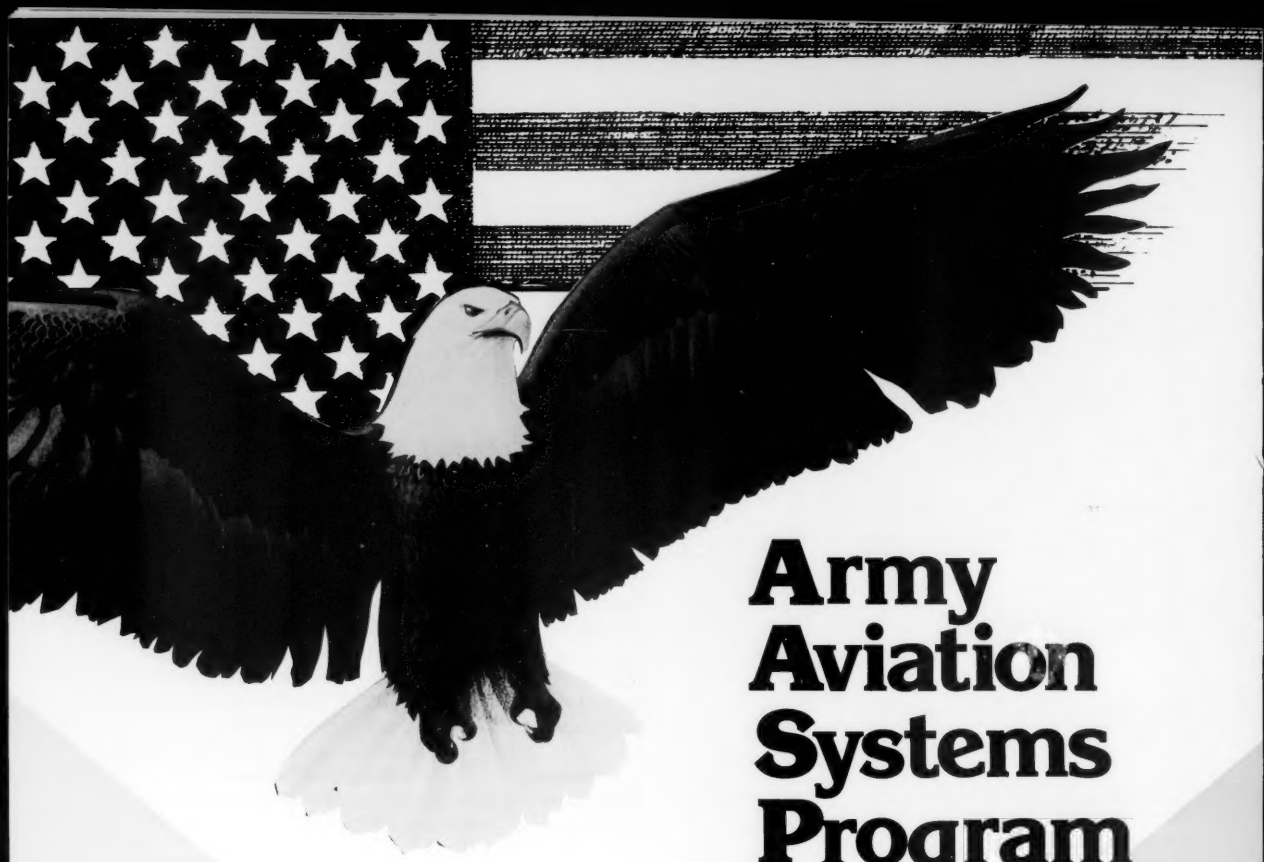
Requests for additional information may be addressed to: Commander, TSARCOM, ATTN: DRSTS-MCFT, 4300 Goodfellow Blvd., St. Louis, MO 63120. Point of contact is Ms. Mary Krsul, AUTOVON 693-2614.

Flyer's Helmet, SPH-4

The locking screw which is currently issued as part of the visor lock assembly, NSN 8415-00-933-9280, is neither stocked nor issued through normal supply channels; NSNs for the screw do not exist. Local purchase of the locking screw is authorized pending accumulation of demand data necessary to warrant assignment of a stock number. Descriptive data and source of supply are:

Screw Locking Assembly, Left Hand Threaded, Part Number 74A2860-1. FSCM 97427, Natick Dwg No. 8-2-523, Iter 1-20, Color Black per CL4. MIL-C-13924, Unit Cost is $1.18 each. Minimum orders $25.00 FOB. Source: Gentex Corporation, PO Box 315, Carbondale, PA 18407. POC: Mr. Dennis J. Nealon, Commercial (717) 282-3550.

If you have a question about personal equipment or rescue/survival gear, write PEARL, DARCOM, ATTN: DRCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120 or call AUTOVON 693-3307 or Commercial 314-263-3307



Army Aviation Systems Program Review '82

MG Carl H. McNair Jr.
Commanding General
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CPT(P) Josef Reinsprecht
Chief of Program, AASPR-82
U.S. Army Aviation Center
Fort Rucker, AL

ARMY AVIATION to the year 2000; that is where our mission area analysis is coming from and pointing to, the how, why and what of Army Aviation from the ground up. This article is the first of an AASPR-82 series of five that will focus on specific details of aviation issues. Succeeding issues will encompass aviation concepts, doctrine and tactics; organization/force structure; training; and materiel

The entire aviation center team is pleased to share with you some background from the Ft. Rucker perspective on the increasingly critical role that Army Aviation must play if our Army is to be able to fight outnumbered on a battlefield and win. Most of our uniformed colleagues should be conversant with our AirLand Battle concepts and doctrine, while to some of our civilian counterparts and retired military family they may be somewhat new; but it is indeed important that we fully understand them and how they differ from our concepts and doctrine of the seventies. *The focus for* the aviation community today should be on where we have been, where we are and how we are using the Training and Doctrine Command (TRADOC) Mission Area Analysis (MAA) and our recent Systems Program Review (SPR) to get where we want to be, and indeed need to be, tomorrow.

YESTERDAY

You all know our history. Forty years ago, Army Aviation was officially born on 6 June 1942—when a team of two light observation aircraft were assigned to each Field Artillery headquarters. The invasion of North Africa was the inauguration of Army Aviation in combat when three Piper L-4 Grasshoppers launched from the deck of the carrier *USS Ranger* and adjusted artillery on the continent. History tells us that one of the three was shot down on the way to the beach.

But, even after 20 years and two major wars, World War II and Korea, it was not until development of the air assault division by the Howze Board that Army Aviation became the key innovation in which helicopters and fixed wing aircraft became principal tactical elements of the Army—providing support in every element of land combat.

Finally, the war in Vietnam conclusively established the worth of Army Aviation—in less than four decades, in three major conflicts, on every continent. Army Aviation has now evolved from a small auxiliary force of the Field Artillery to become a full-fledged member of the combined arms team.

TODAY

As part of the Total Army, our active forces have more than 5,800 aircraft in the field with 7,000 commissioned officers, 5,800 warrant officer aviators, and 23,000 noncommissioned officers and enlisted service members deployed worldwide. However, the status of our total aviation force is critically dependent on our Reserve Components: The National Guard, with about 2,550 aircraft at 85 installations, represents some 50 percent of all CONUS aviation forces while the Army Reserve has about 510 aircraft located in 38 Army Reserve flight facilities across the nation. Together they contain a wealth of tactical experience. The Guard aviation fleet has come a long way in the past 10 years, and while the majority of its aircraft are the same as our active fleet, an area of continuing concern is their attack aircraft which are mainly UH-1 B, C and M model Hueys. The bright spot is that AH-1 Cobras are now being assigned and the National Guard is doing a fine job of training with them. The principal utility helicopter in the Reserve Components will continue to be the UH-1; however, UH-60 Black Hawks are now being issued for cross-training. Furthermore, CH-47A Chinooks will be replaced with CH-47C models during the coming decade, and under current plans they will receive the "D" model Chinook in the 1990s.

Cavalry Brigade Air Attack (CBAA)

With respect to force organization, the generic Air Cavalry Attack Brigade (ACAB) is on the ground for testing in the 9th Infantry Division at Ft. Lewis, WA—where it is designated the 9th Cavalry Brigade (Air Attack) or CBAA. The CBAA is a highly mobile and flexible maneuver brigade tailored to fight (figure 1). It optimizes employment of all the new aviation equipment and provides the division commander additional tactical flexibility

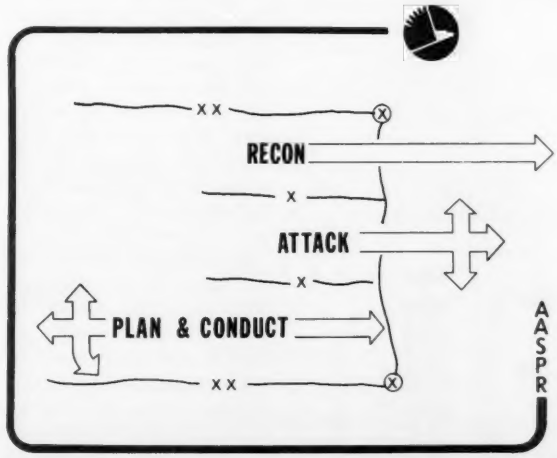


FIGURE 1: Cavalry Brigade Air Attack (CBAA)—a maneuver brigade

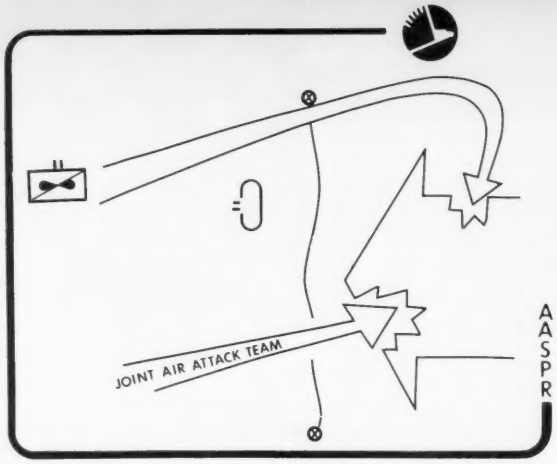


FIGURE 2: Cavalry Brigade Air Attack (CBAA)—aviation maneuver force

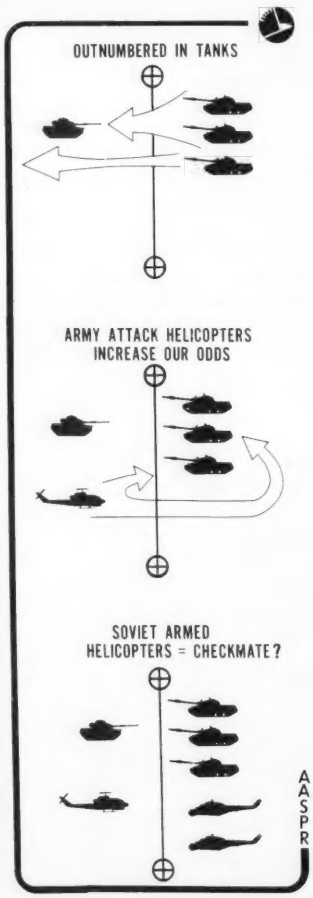


FIGURE 3: AirLand Battle

as all aviation assets of the division are located in this single brigade. The CBAA is an aviation maneuver force which has a full staff complement capable of planning and conducting combat operations to the rear and the flanks of the division, as well as the capacity to assume control of ground assets as necessary for mission accomplishment. The modularity of the brigade was designed to provide for improved command and control of aviation resources and to exploit the ability of the division to mass antiarmor forces (figure 2).

We know so well that the threat we face on the AirLand Battlefield outnumbers us significantly in main battle tanks. For this reason we try to organize and optimize our attack helicopter force to kill enemy tanks and threat systems. This would even the odds for the combined arms team. But now we face the real and imminent possibility that the threat will outnumber us not only in tanks but also in attack helicopters; thus, we could be checkmated (figure 3).

In other words, to protect both our offensive and defensive capability on the ground and in the air, we must carefully guard our aviation forces—and yet go after theirs!!

To combat this threat, Army Aviation forces, through the application of the inherent characteristics of speed and economy of force coupled with great firepower (figure 4) must make *even more* significant contributions to the integrated conduct of the close-in "Land Air" Battle and deep-attack in the extended "AirLand" Battle. These capabilities exist in our aviation organizations and equipment now, but we are going to be called upon to do even more. Engagement of the first echelon by our forward divisions requires that aviation destroy, delay and disrupt the threat. There simply is no other way—and our Chief of Staff has given us that mission, get more out of Army Aviation—in the high technology division—it is the wave of the future!

Just a brief look at the methods of tactical employment for aviation systems and forces reveals they differ little from classical ground fighting techniques. First, combined arms team employment optimizes our effectiveness, nap-of-the-earth terrain flying is essential, engaging from maximum standoff distance is a must, minimizing exposure time to threat air defense artillery is an absolute requirement, and we must neutralize forward air defenses, both ground and air!!

In applying *the fundamentals of tactical employment* Army Aviation must:

- See the battlefield
- Fight as a combined arms team
- Concentrate firepower
- Destroy enemy air defense
- Shock and destroy the enemy
- Attack deep
- Provide continuous airmobile support.

Our aviation force must contribute at all operational levels; it can bring about the winning concentration of forces either by mass or firepower at the critical time and place; it contributes to the control and direction of the battle; and, finally, by improving our ability to maneuver at the operational level, it helps us to fight the battle with firepower instead of manpower. Just as in physics, where F=MA, *Mass and Momentum equal force* on the battlefield. Consequently, in modern mounted warfare, the tank continues

to be the primary offensive weapon and considering the mobility advantage our new M-1 Abrams tank has demonstrated, the possibility cannot be discounted that the new M-1 equipped units may outdrive their combat support and combat service support elements.

In such a contingency, aviation forces may be the only means of providing armor units with the security, fire support and even logistical resupply demanded by a thrust for deep objectives. As armored units move forward, aviation units will support and assist them by performing the following critical combined arms missions:

- Guarding open flanks
- Reinforcing in event of enemy counterattacks
- Deepening penetrations
- Sweeping around flanks to hit enemy reserves
- Providing fires
  - —overwatching
  - —direct
  - —indirect.

The point is: Army Aviation forces are the catalyst to improve our ability through mobility, firepower and C^{3}I capabilities: aviation is essential if we are to execute the doctrine of the AirLand Battle and exploit the full capabilities of all our weapons systems to support that doctrine.

Mission Area Analysis

Which brings us to the Army Aviation Mission Area Analysis (AAMAA) and Army Aviation Systems Program Review (AASPR) process—what they are and how they will help us to develop and exploit our full potential. Our AAMAA completed in March of this year used a front-to-rear conceptual approach, incorporated the materiel and nonmateriel aspects of Army Aviation, and produced a comprehensive chapter report for every arrowhead depicted in figure 5.

Our objective was to take a 1987 force and pit it against a 1992 threat, examine the tasks required to defeat that threat, then determine our ability to perform those tasks. The result was a list of key deficiencies which were in turn scrutinized for oppor-

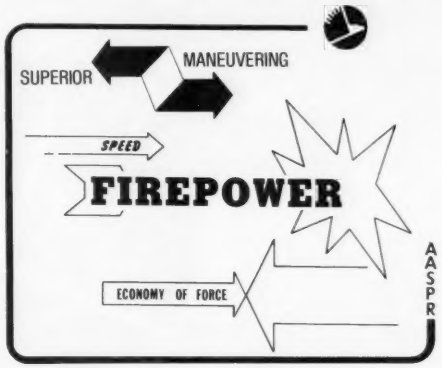
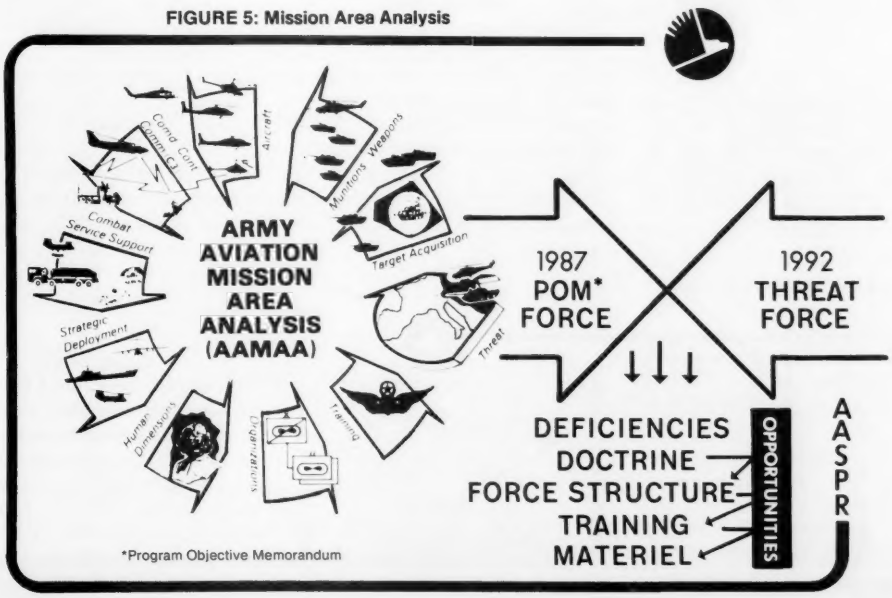


FIGURE 4: Army Aviation Characteristics

FIGURE 5: Mission Area Analysis



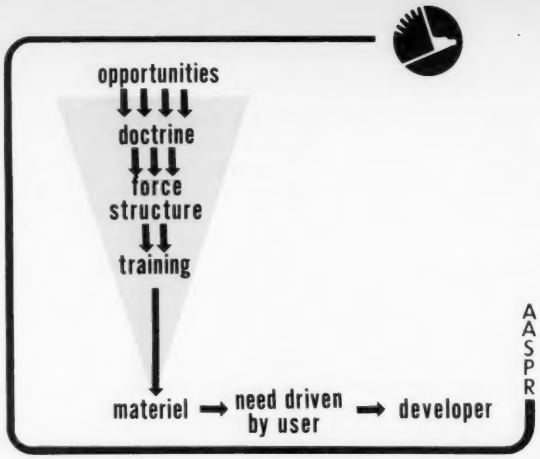


FIGURE 6: Concept Based Requirement System

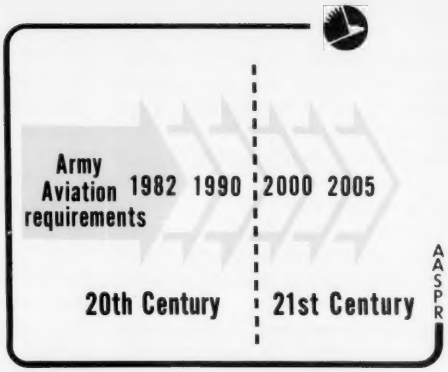


FIGURE 7: Forecast Future Requirements

tunities for resolution first in doctrine, then organization and training and, finally, in materiel.

These opportunities are now evolving into new concepts which will drive our long-term developments—better focusing the user's requirements to meet the challenge of the 1990s (figure 6). This methodology should then permit us to lead the threat, not merely react to it as we have in the past.

Ultimately then, we have identified the real and manageable deficiencies upon which to base Army Aviation requirements through the end of this century and into the next (figure 7). In this way, the Army Aviation-specific MAA will determine how Army Aviation forces can best serve the doctrine of the Air-Land Battle and amplify the effectiveness of the combat arms. It is this analysis that served as the keystone for our AASPR.

Army Aviation Systems Program Review—1982

That brings us to the very purpose of the AASPR conducted on 24 and 25 March at Ft. Rucker—to review Army Aviation—in a forum where the Army's senior leadership, which included 51 general officers to include half of our serving four stars and some 70 field grade officers representing the Army, Navy, Marines and Air Force and the senior executive service, could discuss aviation's deficiencies and opportunities. With the guidance we then received from the Vice Chief, the review chairman, the Aviation Center, is producing a development plan scheduled for publication in October 1982, to guide our aviation forces during the coming years.

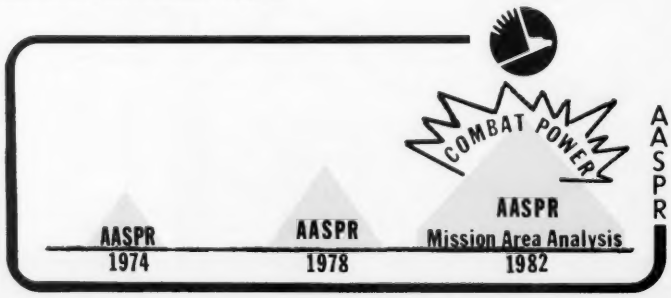
The progress of Army Aviation will be:

- Guided by periodic systems program reviews, and its
- Payoff heightened by mission area analysis.

These and past efforts are all in the pursuit of greater progress with a *realistic* roadmap toward our objective (figure 8). Our combat power will most certainly be enhanced as a result of those efforts.

The resultant of the entire study analysis and review is to assist us in enhancing the effectiveness of the Army and to leap-frog the enemy threat.

FIGURE 8: Army Aviation Progress



Major Issues

While we are moving forward on broad fronts in all areas, the recently completed mission area analysis identified 77 major deficiencies which has led us to further focus on these specific areas of challenge to aviation (figure 9): in concepts, doctrine, and tactics, in organization and force structure, in training, and

Concepts, Doctrine and Tactics Panel

- Survivability of SEMA Aircraft
- Combined Arms Operations
- JAAT Operations
- Helicopter Air-To-Air
- NBC Operations
- Airspace Management
- Reduced Visibility Operations
- Self-Deployment Procedures
- Across FLOT Operations
- Search and Rescue, Survival, Escape, Resistance and Evasion

Organization and Force Structure Panel

- CONUS Versus OCONUS—Aircraft Distribution
- Supporting the Force—Airframes
- War Reserve Stock and POMCUS
- Sustained Operations—Manning
- Wartime Flying Hours

Training Panel

- Commissioned Officer Aviator Training
- Integration of Army Aviation Into Combined Arms Training
- Training Device Development
- Range Adequacy for Training
- Special Electronic Mission Aircraft Training

Materiel Panel

- Aircraft Survivability Equipment
- Aviation Life Support Equipment
- Fleet Obsolescence
- Class IIIA and VA Sustainability
- Desert Operations
- Air-to-Air and Air Defense Suppression Weapons

AASPR

FIGURE 9: Systems Program Review—Panel Issues

last, but not least, in materiel. Quite a list in all areas, but a list that has been prioritized, sanitized and recognized by our community as representing the key deficiencies *where our energies must be focused now* if we are to get the most from Army Aviation.

The foregoing issues and the discussions that followed were summarized by the TRADOC commander to include these highlights (figure 10). General Otis is convinced that these issues are best addressed within the Total Army effort because of aviation's impact on all TRADOC mission areas.

Taking all of this into consideration, General Vessey summed up the conference and issued guidance in a number of the most critical areas (figure 11). Specifically, combined arms training must be a joint service effort; aviation should be integrated into the national training centers and aviation training ranges developed; our air-to-air combat capability as part of our overall air defense must be improved; and our flying hours and crew ratios increased to support wartime projections; our aircraft fleet must be modernized, keeping in mind the fact that we can't buy everything. We must therefore develop an optimum fleet mix of existing and new aircraft and equipment and we must further develop equipment and procedures to capitalize on aircraft self-deployability, survivability of aircraft and aircrew life support systems and finally our logistics support system must be enhanced. The Vice Chief's concluding counsel was that we must structure, equip and train our aviation forces to meet mission needs, recognizing that there are real world constraints such as men, money and time.

Mission

Army Aviation's summary situation report today is that our doctrine is the AirLand Battle—our organization, the cavalry brigade air attack—our materiel will incorporate advan-

General Otis

- Branch Proponency
- Air-To-Air/Air Defense
- Airspace Management
- Sustained Operations
- Guard/Reserve Roundout
- Reinforce Europe
- Combined Arms Training
- Desert Operations
- Fleet Obsolescence
- Logistics Support

AASPR

FIGURE 10: TRADOC Commander's Summary

General Vessey

- Combined Arms Training
- National Training Center
- Training Ranges
- Air-To-Air Capability
- Flying Hours
- Aircraft Modernization
- Self-Deployability
- Survivability/Life Support
- Logistics Support
- Force Structure

AASPR

FIGURE 11: Guidance from the Vice Chief of Staff of the Army

The Mission of the Total Army Is . . .
- To Deter Attack Upon National Interests

And If Deterrence Fails . . .
- To Engage and Defeat Any Enemy
- In Any Environment

E. C. Meyer and John O. Marsh Jr. December 1981

AASPR

FIGURE 12: Total Army Goals

ced technology—and our training programs must fully integrate combined arms.

Furthermore, the mission of Army Aviation has now been redefined by the Chief of Staff of the Army. Our *mission now* is to *"conduct prompt and sustained combat operations."* Gone is the nuance of Army Aviation being simply a supporter, a transporter or an observer. The aviation community will meet its commitment to the Total Army goals as prescribed by the Chief of Staff and the Secretary of the Army (figure 12). Our AAMAA findings culminate our most extensive study ever, and the AASPR will serve as a roadmap to guide us through the bold, new concepts we need to reach our goals. We cannot overemphasize that the Aviation Center and the entire Army Aviation team recognize full well that the effectiveness of our Army depends on combined arms operations. For all of these reasons our Army and our aviation forces are meeting the challenge of the threat and are "Fit to Fight."

Army Aviation has evolved dramatically since its beginning and has come of age, almost 9,000 aircraft strong, with nearly 25,000 Army aviators and thousands more crewmen—throughout our Army, Active and Reserve Components.

Army Aviation is a vital combat system—a solid team, trained, equipped and prepared today for any contingency. For Army Aviation is

truly the most modern and promising of the combat arms, proudly joining with the Infantry, Armor, Field Artillery and Air Defense forces as the combat multiplier of the eighties . . . which is destined to be our decade of full maturity. Aviation can provide to the combined arms team the flexibility, maneuverability, shock action and firepower which will permit our forces to fight outnumbered and win on the AirLand Battlefield today—and tomorrow.

Keeping all of this in mind, let us in Army Aviation "be all we can be" in the next 40 years, as we have been in the first 40.

Next month: *The second article in this series looks at tactics and doctrine.*

ARMY AVIATION'S 40th BIRTHDAY

Continued from page 1

ABOVE: Major General Carl H. McNair Jr., Aviation Center commander and Brigadier General William W. Ford, Retired, review the troops at Ft. Rucker during 40th anniversary observances on 4 June. General Ford played the key role in bringing about the birth of Army Aviation (see page 2). BELOW: General McNair participates in ceremonies dedicating the future site of the Army Aviation Museum at Ft. Rucker. At left is Lieutenant General John J. Tolson III, Retired, former Aviation Center commander and the Honorable William L. Dickinson, U.S. Representative for the 2d Congressional District which includes Ft. Rucker

they can be worn with pride and a confidence that Army Aviation will meet challenges in its future with the same spirit of professional dedication that has marked its four decades of selfless service.—General E. C. Meyer, Chief of Staff, USA

• Happy birthday to the Home of Army Aviation and best wishes for continued success in the next forty years.—General John W. Vessey Jr., Vice Chief of Staff

• Congratulations . . . accomplishments of your officers, soldiers and units, over four decades and during three wars, have served as a constant and living testimony to the vital place you occupy in the defense mosaic of our great country.—General Glenn K. Otis, CDR, USATRADOC.

• Salutes Fort Rucker and Army Aviation . . . . As we celebrate the anniversary of your founding, we can look back with pride at the professionalism and dedicated service Army Aviation has consistently provided in peace and war to this great nation we love so well.—General Donald R. Keith, CDR, DARCOM.

• The future looks even brighter with Army Aviation playing a challenging and demanding role in the combined arms team.—General Donn A. Starry, CINC, USREDCOM.

This issue reflects the annals of our history ranging from the aviation entity itself to an individual aircraft, thus delineating truth we all recognize: Each of us today is engaged in writing some portion of tomorrow's history. The contributions will not all be the same but they will all be important. Aviation has made its mark on our Army and the mark it makes tomorrow is in your hands. So read on into history. It will make you proud to be a member of the aviation team.

U.S. Army Communications Command
ATC ACTION LINE

THE NATIONAL AIRSPACE SYSTEM PLAN (NASP)

Mr. John McKeeman
U.S. Army Air Traffic Control Activity
Aeronautical Services Office
Cameron Station, Alexandria, VA

AFTER A 10-MONTH review of the national airspace system, the Federal Aviation Administration (FAA) has charted a comprehensive plan (the NASP dated December 1981) for modernizing and improving air traffic control and airway facilities service from now to the year 2000.

It specifies improvements to facilities and equipment and supporting research and development associated with the national airspace system. Particular emphasis focuses on terminal and en route air traffic control, flight service stations and weather services, ground-to-air services, interfacility communications and auxiliary services such as airway facilities maintenance and flight inspection of navigational aids.

The plan theme is that safety, capacity, productivity and economy will be realized through higher levels of automation, consolidations of major facilities and the application of rapidly changing and lower cost technologies in telecommunications. FAA recognizes that implementing the plan will be expensive and will proceed more slowly than many would wish. However, the agency is certain that the measures contained in the plan are essential to flight safety, efficiency and economy and must begin immediately to meet the projected needs and demands of U.S. aviation.

The NASP makes the following assumptions:

- Aviation demand will grow significantly during the next 20 years.
- Air carrier routes and service will reflect a better balance between trip frequency and cost than would be the case under a closely regulated system. The industry will be affected by deregulation for several more years before routes and schedules stabilize.
- The commuter industry will be affected by deregulation for several more years. Anticipated growth will require many years of adjustmet before routes and schedules stabilize. The number of commuter operators is expected to decrease over the period.
- The rapid growth in business use of general aviation will continue. Significant growth in turbopowered aircraft will result in increased operations above 12,500 feet. This growth is expected though both fixed and variable aircraft operating costs are expected to rise.
- General aviation aircraft and hours flown will nearly double in the next two decades.
- The number of helicopters and helicopter operations will continue at a high growth rate. City-center to city-center operations are expected to be commonplace by the turn of the century.
- System limitations on any class of users' right-of-access to the system should be imposed only when no other resource is availble to ensure the common good. Any such restrictions should be removed as soon as possible and not be considered a final solution. However, to gain access to the system, individual users must comply with conditions applicable to all classes of users and essential to the safety and efficiency of the system.
- Specific equipment may be required to operate in designated airspace.
- Individual user's preferences for routes, runways, approaches, altitudes, etc., cannot be honored if they will cause delays to other users.
- No change to the system will be permitted to reduce safety or increase risk. A very high level of midair collision protection, including a backup ground-independent airborne separation device called TCAS, will be available. "See-and-be-seen" operations, which will continue, may be supplemented by new systems. Self-separation may be feasible in some airspace.
- Airport capacity limitations at busy airports will be the constraining element in the national airspace system. The national airport system is essentially in place. Few new air carrier airports are anticipated and most major airports have limited expansion capability due to physical, environmental, airspace, runway and/or landside limitations. These factors will continue to impose capacity constraints at many large and medium hub airports.

The first two chapters of the plan provide an overview and a projected demand upon the national airspace system. The remaining six chapters provide the descriptions and planning for: en route systems, terminal systems, flight service systems, ground-to-air systems, interfacility communications and auxiliary systems.

The NASP en route and terminal chapters have the following aims:

- The major facilities will be consolidated from more than 200 today to about 60 by the year 2000.
- That common modular computers, software and controller work stations (i.e., sector suites) will increase capacity, availability and satisfy a wide range of needs.
- That higher levels of automation will improve safety, fuel efficiency and productivity.

In summary, this is an energetic plan to improve the national airspace system for all users, to include Army Aviation, into the next century.

Readers are encouraged to address matters concerning air traffic control to:
Director, USAATCA Aeronautical Services Office, Cameron Station, Alexandria, VA 22314